

**DEVELOPMENTAL LANGUAGE DISORDERS:
A LONGITUDINAL STUDY OF COGNITIVE, SOCIAL
AND PSYCHIATRIC FUNCTIONING**

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Section of Developmental Psychiatry, Division of Psychiatry

University of Nottingham

Thesis submitted to the University of Nottingham for the degree of

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ABSTRACT

A cohort of boys with developmental language disorders (DLD) have been followed up from childhood into adult life. At this most recent follow up, the DLD cohort was in their mid thirties ($n = 17$). The cohort was assessed on their cognitive, social and psychiatric functioning compared to their non language disordered siblings ($n = 16$), an intelligence quotient (IQ) match comparison group ($n = 17$) and a general population comparison group ($n = 1155$). The DLD, siblings and IQ match groups were assessed on intelligence, language, literacy, social cognition, visual and verbal memory, phonological processing, psychopathology and adult social adaptation. Relative to the comparison groups, the DLD cohort showed a significantly impaired performance on all of the cognitive measures except performance intelligence and visual and verbal memory. Even in their mid thirties, the social adaptation of the DLD cohort continued to be poor compared to the siblings and a general population cohort, particularly in the areas of employment, independent living and relationships. In adult life, three members of the DLD cohort had developed psychoses and one DLD adult had been diagnosed with major depression. No major psychopathology was found in the sibling group. The fourth phase of this study has shown that as adults the DLD cohort continued to have persisting impaired cognitive abilities including language, literacy and specific deficits within phonological processing and social cognition. Furthermore, the DLD cohort experienced significant difficulties in adult social adaptation and are at an increased risk of severe psychiatric disorder. It is proposed that phonological processing and social cognition are two independent causal cognitive deficits in developmental language disorders. The phonological processing deficit causes the persisting language and literacy impairments and the social cognition deficit underpins the social adaptation difficulties which develop later in life. Explanatory theories are put forward to delineate the changing symptomatology within the cognitive, social and psychiatric functioning of developmental language disorders from childhood into adult life.

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DECLARATION

This dissertation has not been submitted in whole or in part, for any other degree, diploma or qualification at any other University. All the data has been collected by the student.

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PREFACE

Developmental language disorders (DLD) have traditionally been defined by exclusion as they cannot be attributed to an aetiological or functional cause such as hearing loss, low intelligence or environmental deprivation. Historically, these children with unexplained deficits in language development have been given various labels such as receptive and expressive aphasia or dysphasia, delayed language development, developmental language disorder and most recently specific language impairment (SLI). Generally, all these terms are used to describe children whose language abilities are significantly below their chronological age but whose performance intelligence (IQ) is within the considered normal range. Furthermore, there are no obvious neurological, sensory or physical impairments that directly affect their language development. For the purpose of clarity, the term developmental language disorder (DLD) will be used to refer to children with these unexplainable impairments in language development.

Approximately, 3% of 3 year old children present with an unexplained language impairment (Richman, Stevenson & Graham 1982, Fundudis, Kolvin & Garside 1979). However, their prognosis is not yet fully understood and research into the adult outcomes of these children is extremely limited. Yet, knowledge of the prognosis of these children into adult life is extremely valuable for both theoretical and clinical purposes. Follow ups of children with developmental language disorders which extend beyond middle childhood into late adolescence and especially adult life are essential to determine the true adult outcome of developmental language disorders.

This thesis presents the fourth assessment of a cohort of boys diagnosed with developmental language disorders in childhood. This cohort was originally recruited as a language control group to an autistic cohort (Bartak, Rutter & Cox 1975). The initial hypothesis of this comparison aimed to determine whether autism was simply an extreme form of a language disorder. Both cohorts were assessed in childhood (Bartak, Rutter & Cox 1975), middle childhood (Cantwell, Baker, Rutter & Mawhood 1989) and in their early twenties (Mawhood, Howlin & Rutter 2000, Howlin, Mawhood & Rutter 2000). The cognitive, linguistic and social outcome of the autistic cohort was different to the DLD cohort, thus disproving the initial hypothesis. However, it was the development of the DLD cohort which proved to be more variable over time. Between childhood and middle childhood, the social functioning of the DLD cohort deteriorated even though their language abilities improved. In their early twenties, they had a much poorer outcome than initially anticipated, particularly within social adaptation and mental health. This suggested that social adaptation was not simply a consequence of language ability. Indicating that their difficulties may be reflective of a broader social-cognitive impairment associated with developmental language disorders. Due to the unexpected problems, the DLD cohort were found to be experiencing in their middle childhood and early twenties, this study focuses solely on the functioning of the DLD cohort in their mid thirties and their longitudinal progression from childhood.

This follow up of only the DLD cohort into their mid thirties enabled the true longitudinal profile of language, literacy and intelligence in developmental language disorders to be established. At this assessment in their mid thirties, the DLD cohort will have entered well into adult life. Thus providing a clearer picture of cognition,

social adaptation and psychiatric functioning. Examination of the cognitive profile allows the identification of possible causal cognitive deficits which can explain the behaviours constituting the language disorder. By their mid thirties, most adults should have had the opportunity to establish independent lives and relationships outside of their family of origin. Therefore, issues of social adaptation will be more clearly defined. Finally, more time will have elapsed to enable a better assessment of psychiatric vulnerability and risk.

In addition, this phase four follow up provides an opportunity to use appropriate comparison groups to determine the outcome of developmental language disorders independent of intelligence and social and family background. The previous follow ups were unable to identify whether the difficulties experienced by the DLD cohort were greater than individuals from a similar social background or with similar intelligence but without a language disorder.

The study is divided into four main chapters. The *first* section of Chapter One provides an overview of the development of language and communication, describing linguistic, psycholinguistic and interactive models of language and communication. Theoretical accounts to explain the development of speech and language are then discussed. The *second* section questions the validity of the definition and classification systems that have evolved over time to both describe and subtype developmental language disorders. The *third* section discusses the explanatory theories proposed to date to explain the cognitive and social deficits identified in developmental language disorders. The *fourth* section collates existing longitudinal studies of developmental language disorders to present a succinct

summary of progression from childhood to adult life and eventual outcome. The *fifth* section explores the relationship between language and psychiatric disorder, delineating the mechanisms involved. Finally, the *sixth* section finishes with a description of the first three phases of this longitudinal study and the implications from these phases to the design of this thesis.

Chapter Two describes the methodology of the thesis. Specifying the details of the adults with developmental language disorders and the sibling, intelligence and social adaptation comparison groups. The cognitive, social and psychiatric measures used in the thesis are described.

Chapter three presents the results from the analyses of the data across the cognitive, social and psychiatric functioning measures. This is divided into four main sections. The first section presents the cognitive profile of the DLD adults in their mid thirties across intelligence, language, literacy, visual and verbal memory, phonological processing and social cognition. The second section describes the social adaptation of the DLD adults within educational provision and academic outcome, employment, independent living, relationships, family life and receipt of welfare benefits and housing tenure. The third section explores the psychiatric functioning and outcome of the DLD adults and the fourth section describes the economic cost of developmental language disorders.

Chapter four discusses the overall findings of the thesis, in which developmental language disorders are identified as a much more pervasive impairment than traditionally thought. With significant impairments in cognition, adult social

adaptation and psychiatric functioning. The findings from the mid thirties assessment are compared to the assessments in childhood, middle childhood and early twenties to present a comprehensive longitudinal profile of developmental language disorders. In addition, predicting outcome is explored to identify the childhood profile which predicts the most superior adult outcome. The hypotheses initially presented are revisited to delineate the changing symptomatology of developmental language disorders and the explanatory and causal mechanisms involved. The results are further employed to identify the significant clinical needs of children with developmental language disorders and how service provision needs to change. Finally, a number of conclusions are drawn from the findings and implications for further research discussed.

CHAPTER ONE: BACKGROUND TO THE STUDY

SECTION 1.1: THE DEVELOPMENT OF LANGUAGE AND COMMUNICATION

Developmental language disorders are essentially disorders in the development of language where there is no identifiable aetiological or functional cause. Developmental language disorders need to be discussed within the context of normal language development. Therefore, a brief summary of language development is presented and theories as to the nature of language are then discussed.

1.1.1) OVERVIEW OF NORMAL SPEECH AND LANGUAGE DEVELOPMENT

Both children and adults are capable of understanding much more language than they can produce. Reynell (1980) identified discrete developmental stages of language comprehension: stage 1; situational understanding, stage 2; symbolic understanding, stage 3; understanding at the 1 word level, stage 4; understanding at the 2 word level and stage 5; understanding at the 3 word level. All normally developing children pass through these stages of comprehension development. Table 1.1.1 describes these stages further.

The development of expressive abilities occurs in conjunction with comprehension and is considered dependent on comprehension. Crying marks the start of an infant's expressive development. Initially, crying reflects the child's internal state of hunger, pain and then a need for attention.

Table 1.1.1 Developmental stages of language comprehension (Reynell 1980)

Stage of understanding	Description of the stage
Situational understanding Birth to 9 months	Infant appears to respond to and understand some words. However, the infant gains no meaning from the words themselves and instead relies wholly on the situational cues within the context.
Symbolic understanding 9 to 18 months	Reliance on context reduces. The infant is able to hear some words and match them to the object, concept, and action etc taking place around them. Therefore appreciating that words are symbols.
One word level understanding 18 months onwards	The infant can understand one information carrying word within a phrase or short sentence. Names of familiar and favourite people and objects are learnt first. From this stage, understanding accelerates to comprehension at a two word level, then three and more with complex grammatical structures and meaning being understood,

The development in speech musculature at about 3 months is followed by the beginning of vocal play at approximately 4 months. Vocal play is when an infant starts producing speech like sounds in the form of cooing and babbling. These early speech sounds then expand into reduplicated babbling which is where segments of babbling are repeated. Infants then start to produce protowords and their real first words. Protowords are strings of speech sounds produced with a variety of stress and intonation patterns. They are the child's own made up words, which they use to refer to things in their environment. Protowords can either precede or cooccur with a child's real first words. Real words usually appear between the end of the first year and 18 months.

A child's first real words are usually those that denote the most familiar and frequent objects and people in their environment. As the child grows older, their small lexicon

of real words expands from familiar frequent nouns to less familiar and frequent nouns to elements which constitute more complex grammatical structures.

Speech and language development starts from birth and enormous progress is achieved in the first year of life. Once first words have been established, vocabulary grows at a phenomenal rate and syntax develops with children producing syntactically complex utterances by 3 years of age. The question arising from this is how do children manage to develop speech and language in such a short period of time?

1.1.2) THEORIES ACCOUNTING FOR SPEECH AND LANGUAGE DEVELOPMENT

Theories seeking to account for the origins and development of speech and language can be grouped into three categories: innate theory, behaviourist theory and pragmatic theory. Each theory has its own arguments and evidence to explain speech and language development.

Innate theory

The “language instinct” is a term used by Pinker (1994) to refer to the innate instinct humans have to learn, speak and understand the language that they are exposed to. Such an instinct supports the innate theory of language development led by Noam Chomsky (1957).

Chomsky maintains that infants are born with a language acquisition device (LAD), defined as a specialised language processor. The LAD contains innate language knowledge in the form of a “blue print” for the rules of a Universal Grammar.

Universal Grammar referring to the theories of the mental grammars underlying people's knowledge of particular languages and of the Universal Grammar underlying the particular grammars of all languages. Innate theory is preoccupied with syntax development and therefore accounts for syntax development at the expense of other areas of speech and language.

Behaviourist theory

Innate theories of language development very much defied the behaviourist theories that preceded them. In the 1950s, the field of speech and language was dominated by behaviourism, advocated mainly by Skinner (1957). Speech and language development was viewed as learnt behaviour, based upon behavioural theories of learning such as classical and operant conditioning. Behaviourism argued that language is learnt through imitation, practice and positive reinforcement which caregivers in the child's environment provide. Such interaction has been termed "Motherese" (Ferguson 1977) and refers to the intensive sessions of conversational give and take, with repetitive drills and simplified grammar that occurs in the interaction between caregivers and their child.

Innateness and behaviourism are at the extreme ends of the debate into the origins of speech and language development. A more recent and holistic view has been encapsulated by what has been termed pragmatic theory.

Pragmatic theory

This theory is based on the premise that language evolved as a communication system and therefore language is learnt through experience and events. Aspects of speech

and language such as vocabulary and syntax are not learnt specifically and independently. Instead all aspects of speech and language are incorporated into communication. According to pragmatic theory, speech and language development is dependent on the infant first of all establishing communicative intent.

Bates (1976) identified a stage of *reflexive communication* from birth to 6 months and a stage of *intentional communication* from 6 months onwards. There is an important shift that takes place at approximately 6 months of age when the child has developed meaning that he wants to communicate to his environment. This shift to intentionality is considered an important precursor to speech and language development.

An infant's communicative intent; the response the infant receives; and the interaction between the caregiver and infant are the factors implicated in language and communication development. The infant's early actions and vocalisations are reflexive but parents give them meaning and respond to them so that they interpret certain actions and gestures as meaningful. This interaction helps the infant to learn to use actions and vocalisations with intention and therefore attempt to convey meaning.

It is unlikely that any one of the theories presented can adequately account for the phenomenon of language and communication development. Innate theory focuses entirely on syntax development with no explanation for the other components of language, i.e. vocabulary, pragmatics, comprehension etc. It is a very passive account as no importance is directed to environmental factors such as the role of parents and learning language through events. Innate theory rules out the fundamental premise of

language as being a communicative tool and that the development of communicative intent is not a prerequisite of language and communication development.

There is a role for behaviourist theory as it supports pragmatic theory. The development of communicative intent is to some extent dependent on the environment and caregivers. Pragmatic theory encompasses the behaviours that are present both within the infant and in the environment.

The most logical approach to explaining speech and language development is to combine all three theories. There is some innate language ability but the role of the environment and developing a need to communicate will theoretically determine the development of language and communication.

1.1.3) SUMMARY

A brief overview of speech, language, communication and their development has been presented. The theoretical accounts of speech and language development, although fascinating are unsubstantiated. However, there is currently much interest in innateness, specifically genetic markers and heritability of both language development and language impairment.

Language is a complex phenomenon. Understanding the behaviours which comprise language and their development in addition to theoretical constructs provides a basic framework against which abnormal language development and developmental language disorders can be compared.

SECTION 1.2: VALIDITY OF CURRENT AND HISTORICAL CLASSIFICATIONS OF DEVELOPMENTAL LANGUAGE DISORDERS

Paul (1995) defines speech and language impairment as there being “some difference between the child with an impairment and other children”. This very neutral and broad definition emphasises that these children do differ from those without speech and language impairments. However, the behaviours which constitute and characterise each child defined as speech and language impaired fail to be accounted for by such a definition. Developmental language disorders (DLDs) form one subgroup of children with speech and language impairments.

1.2.1) DEFINITIONS

Children with unexplained difficulties in language acquisition have been variously referred to as having “developmental dysphasia”, “developmental aphasia”, “delayed language”, “specific developmental language disorder” and most recently “specific language impairment”. All these terms are and have been used to refer to cases where language fails to follow a normal developmental course for no apparent reason. The choice of terminology used to date has not been clear. The definition of “aphasia” is “loss of speech” and “dysphasia” means “disorder of speech”. These are neurological terms and are used synonymously to refer to language disorder resulting from brain injury. It is this neurological connotation that has led to these terms falling into disfavour when referring to developmental language disorders, where brain damage is not an identifiable aetiological cause. The varied terminology which has developed in the study of developmental language disorders shows how little is really understood about the condition. To clarify, the term developmental language disorder will be the term used in this thesis.

As a result of defining by exclusion, developmental language disorders have come to be wrongly considered as a unitary condition (Bishop 1989). The following discussion of the possible subclassifications of developmental language disorders shows that within the label of developmental language disorder, subsets of children with differing patterns of speech and language behaviours exist.

1.2.2) CLASSIFICATION APPROACHES

Aetiological, linguistic and developmental approaches have contributed to the classification of speech and language impairments and subsequently, developmental language disorders. The *aetiological* model attempts to identify an aetiological cause for the speech and language impairment and then assigns the child to a diagnostic category. Thus the speech and language problem is considered secondary to a clearly defined medical or functional condition. Table 1.2.2 gives an overview of speech and language impairments which can be attributed to an aetiological or functional cause.

In contrast, the *linguistic* model (Crystal & Varley 1993) ignores any possible aetiological causes of speech and language impairment and concentrates on the presenting speech and language behaviours which characterise the impairment. Within the linguistic model, developmental language impairments have historically been divided into receptive and expressive types (Morley 1972). Children with receptive impairments

Table 1.2.2 Aetiological and functional causes of speech and language impairment.

Category of speech and language impairment	Aetiology	Features of speech and language impairment
Pure speech disorders	Defected speech motor system caused by neurological damage For example, cleft palate and dysarthria	Neurological damage affects the articulatory mechanism therefore it is not able to function as normal. The predominant features of a damaged speech motor system are usually abnormal speech patterns and unintelligibility.
Speech and language impairment associated with sensory deficits	Conductive hearing loss An obstruction in the transmission of sound from the auditory canal to the inner ear. The inner ear is intact and functions as normal e.g. otitis media with and without effusion (OM(E)) where the middle ear becomes inflamed or infected resulting in fluid building up within the middle ear which then obstructs the transmission of sound to the inner ear.	Children with conductive hearing losses caused by OME generally present with delays in speech and language development showing features such as poor listening skills, poor understanding and attention problems. These are often reflected in a paucity of both receptive and expressive language development. Once the hearing loss has been identified and remediation implemented speech and language development usually resumes.
	Sensorineural hearing loss This occurs as a result of damage to the cochlea of the inner ear, which means that the inner ear is not able to function normally. Sound is transmitted from the auditory canal to the inner ear but the cochlear is unable to stimulate the Vestibulocochlea (VIII) cranial nerve. The damage can be congenital, a result of injury, infection and ageing.	Children with sensorineural hearing loss tend to follow a normal but very delayed pattern of speech and language development. There can be specific problems within syntax and phonology.

Table 1.2.2 continued

Mental retardation	Chromosomal disorders Hydrocephalus	A delay in speech and language development which forms part of the child's global developmental delay. Overall, these children have poor phonology and often articulation, their acquisition of speech and language skills take longer than usual and development often plateaus. More importantly, these children remain limited in their use of speech and language throughout their lives.
Acquired disorders of speech and language	Focal lesion Lesions which are localised to a specific area of the brain. This usually only affect language if they are unilateral to the left cerebral hemisphere.	In infants, left hemisphere lesions usually cause a reduction in general intelligence without specific effects on language ability. However, left hemisphere lesions acquired after a child has learned to speak can result in more permanent language impairment. The older the child, the greater the probability that the aphasia will not fully recover and therefore the child's premorbid potential for speech and language development will not be fully achieved.
	Acquired aphasia secondary to seizure or convulsive disorder This is where a convulsive disorder is acquired after a period of normal development. The cause of the disorder is unknown. This has been termed Landau – Kleffner syndrome and usually occurs between the ages of 4 and 7 years.	Results in a sudden or sometimes gradual loss of language skills.
Speech and language impairment associated with environmental factors	Severe neglect Severe neglect has been shown to be a risk factor for poor speech and language development. The case of "Genie" who was raised in extreme isolation and discovered at the age of 13 years after years of being tied to a potty seat in a dark room with no language spoken to her support the severe consequences of neglect	Although both language and cognition are severely impaired in such grossly maltreated children, gains are made in both areas after rescue. However, if severe neglect persists past early childhood, the prognosis for normal language development is very limited, even with intervention.

Table 1.2.2 continued

Speech and Language impairment associated with behavioural and psychiatric disorders	Selective mutism A psychiatric disorder causing a secondary speech and language problem	Children who show a persistent refusal to talk in one or more social situations.
	Conduct disorders These involve aggressive and sociopathic behaviour.	These children often have concomitant speech and language difficulties
	Pervasive developmental disorders and autism These are psychiatric disorders which have a more clearly established neurological base than the behavioural and socioemotional disorders do. Some neurological correlates have been identified in children with autism but no concrete neurological sign yet defines this syndrome.	Autism is primarily a disorder of communication than language. There are certain language characteristics that are associated with autism but what differentiates autism from language disabilities is its impact on communicative ability.
	Attention deficit hyperactivity disorders and attention deficit disorders without hyperactivity In general, attention deficit disorders without hyperactivity involve problems with poor attention and concentration, impulsiveness, distractibility, poor organisational skills and difficulty in completing tasks without close supervision. When a hyperactivity component is present, the child is restless and fidgety, runs and climbs excessively, and can talk excessively as well.	Children with some form of attention disorder often have language deficits as well.
	Anxiety and affective disorders These disorders can include depression and avoidant disorders such as excessive fear in social situations or excessive anxiety about performance in social settings and schools.	Speech and language abilities in these disorders may be affected in a variety of ways and some children with these disorders have been found to fail speech and language screenings.
Speech and Language impairment not attributable to any of the above	Developmental language disorders Theses have traditionally been defined by exclusion. These children have normal hearing, non-verbal intelligence within the normal range, an absence of physical and/or emotional disorders and receive adequate language stimulation in the home environment. These children's overall development is normal except in the area of speech and language. There is no overt cause to explain the developmental language disorder.	See section 2

were thought to develop receptive deficits as a result of input difficulties. In contrast, the expressive group had major difficulties in the production of vocabulary and development of grammar. Morley's dichotomy of expressive and receptive dysphasia proposed that a severe delay could occur in either domain, independent of the other. This traditional receptive expressive dichotomy has survived despite empirical evidence that children with expressive disorders also have defective language comprehension (Adams 1990, Bishop 1982).

The developmental model (Leonard 1979, Bloom & Lahey 1978, Reynell 1980) is also a descriptive model which uses knowledge of normal language development to try and make a distinction between children classified as language delayed or language disordered. Therefore, if a child's acquisition language behaviours follows the normal developmental route but are slow in appearing the child is said to have a delay. In comparison, if a child is omitting certain language behaviours and failing to follow the normal developmental route the child is said to have a disorder. A delay and a disorder can be viewed on a continuum of severity (Leonard 1979). This poses the problem of at what stage should a delay be regarded as a disorder, and should delay and disorder be regarded as separate conditions (Bloom and Lahey 1978). The term delay also implies that the deficit resolves and normal language development is achieved.

Having discussed the main approaches to defining and classifying speech and language impairment and the major role the aetiological model has played in the classification of speech and language impairment, it is now possible to focus on

developmental language disorders and where developmental language disorders fit into the broad spectrum of speech and language impairment.

1.2.3) DEFINITION AND CLASSIFICATION OF DEVELOPMENTAL LANGUAGE DISORDERS

Generally, the term developmental language disorder is used to describe children who fail to develop language normally despite satisfactory development in other areas. There is no apparent overt cause for the failure in language development.

One of the most comprehensive definitions of this group is provided by the research criteria specified by the World Health Organisation (International Classification for mental and behavioural disorders, ICD –10, 1993)

- Language skills, as assessed on standardised tests, are below the 2 standard deviations limit for the child's age
- Language skills are at least one standard deviation below performance intelligence as assessed on standardised tests
- There are no neurological, sensory, or physical impairments that directly affect use of spoken language, nor is there a pervasive developmental disorder

A distinction is made between receptive language disorder, where comprehension is more than 2 SD below age level, and expressive language disorder, where only expressive language is this severely affected, and where understanding and use of non verbal communication and imaginative language functions are within the normal range.

From a clinical viewpoint, children who fit this criterion present with varying speech and language behaviours. From a theoretical perspective, very few attempts have been made to try and reliably divide this group of children into subgroups with the same or similar patterns of speech and language behaviours. These attempts to subclassify

developmental language disorders can be described within the three categories of clinical, psychometric and linguistic approaches.

Clinical subtyping

The clinical subtyping approach involves identifying clusters of speech and language behaviours seen across a group of similar individuals. Rapin & Allen (1987) assessed a group of 120 children with speech and language impairments including severe developmental language disorders and autistic continuum disorders. Their aim was to show that there is no one diagnosis of developmental language disorder. The children were subgrouped according to the most salient characteristics of their expressive language, interactive behaviour and comprehension. The children were assigned to subtypes labelled as verbal auditory agnosia, severe verbal dyspraxia, lexical syntactic syndrome, phonological programming deficit, phonologic – syntactic deficit syndrome and semantic pragmatic deficit. These subtypes are described further in table 1.2.3. The subgroups varied from severe comprehension deficits to speech motor problems to expressive syntax and phonological deficits and finally to children whose primary speech and language difficulties were in the semantic and pragmatic components of language.

Table 1.2.3 Rapin & Allen’s clinical subtyping of children with speech and language impairments (1987)

Subtype	Description
Verbal auditory agnosia	<p>These were children with no or very limited speech and language comprehension. Superficially, they appeared to be deaf in that they showed very little response to auditory stimuli. However, brain stem tests showed that they responded to pure tones which ruled out a peripheral hearing impairment and suggested an impairment in the central nervous system, perhaps in the auditory cortex.</p> <p>These children were able to form good social relationships and displayed good social interaction skills. They also showed normal intelligence.</p>
Severe verbal dyspraxia	<p>These were children with a severe limitation in speech production thought to be a result of problems in the neuromotor planning of speech. The features included difficulty in consistently imitating sounds, an inability to produce all the sounds of a language, inconsistent speech errors and difficulty sequencing speech sounds correctly.</p>
Lexical syntactic syndrome	<p>These were children who displayed a primary problem in word finding. This group were subdivided into two groups, group one who showed a paucity of language and word finding difficulties. The second group who displayed word finding difficulties but used a variety of word fillers to help them try and retrieve words. They displayed adequate comprehension skills and social interaction skills.</p>
Phonological programming deficit	<p>These were children who were felt to be more fluent than children in the severe verbal dyspraxia subtype and therefore had problems in the phonological programming stage of speech.</p>
Phonologic-syntactic deficit syndrome	<p>This was the most common subtype. The primary impairments of these children were in phonology and syntax... Whereas the abilities within semantics and pragmatics were adequate.</p>
Semantic-pragmatic deficit	<p>These were children who were verbose and superficially appeared to communicate satisfactorily. However, the content of their language was inappropriate and irrelevant. Their main deficits were in semantics and pragmatics, however, their syntax and phonology was adequate.</p>

Psychometric subtyping

The psychometric approach aims to classify children with developmental language disorders using multivariate statistical procedures to analyse the performance of a sample of children with DLD on a battery of standardised tests. The psychometric approach includes several typologies. These are Aram & Nation's psycholinguistic model (1975), Wolfus, Moscovitch & Kinsbourne's psycholinguistic model (1980) and Wilson's and Risucci neuropsychological processing model (1986).

In 1975, Aram & Nation published the only quantitative exploration of subtypes in the developmental language disordered population and formed functional groups based upon indices of phonologic, syntactic and semantic aspects of expressive language. This study is of interest because it demonstrated that subgroups could be identified through quantitative procedures and operationally defined in terms of standardised indices of language function. However, it failed to address issues of either internal or external validity. Their psycholinguistic model characterises expressive disorders as either a nonspecific formulation repetition disorder or a syntactic and speech programming disorder.

Wolfus et al (1980) assessed 19 children with a mean age of five years and seven months with a diagnosis of specific language disorder. The group had no history of hearing impairment or oral abnormalities and IQ was within the normal range as measured by the Wechsler Intelligence Scale for Children - Revised (WISC-R) (Wechsler 1974). The group were assessed on various measures including syntactic comprehension and production, semantic ability, digit span, syllable sequencing and phonological discrimination and production. The analysis yielded two groups. The

first was a group with difficulties in the production of syntax and phonology but not in the comprehension of syntax or in semantic ability. The second was a group characterised by a global syntactic deficit and semantic impairments who performed more poorly on a variety of perceptual and linguistic tasks. In essence, the 19 subjects were assigned to either an expressive or expressive-receptive subgroup according to the pattern of deficits across the tasks they were assessed on.

Wilson & Risucci (1986) assessed 93 children with a mean age of 4 years and normal intelligence (as measured by the Wechsler preschool and primary scale of intelligence (WPPSI) (Wechsler 1967)) on several psychometric measures including auditory and visual perception and discrimination and visual and auditory memory. A diagnosis of developmental language disorder was made in the absence of clinical evidence of cerebral palsy, learning disability, attention deficit disorder, hearing impairment and a primary emotional disorder. Of the 93 children, 78 were assigned according to their pattern of performance across the tasks to 5 different subgroups. The 5 subgroups were expressive, receptive, auditory memory and retrieval, global and no deficits. The comprehension subgroup was further subdivided into auditory semantic comprehension disorder, auditory and visual semantic comprehension disorder and auditory semantic comprehension and auditory and visual short-term memory disorder. Wilson & Risucci (1986) argue that their neuropsychological processing model differentiates auditory memory and retrieval deficits from organisation/formulation deficits and takes into account whether the child demonstrates other neuropsychological deficits such as visual memory impairment.

Linguistic subtyping

The *linguistic* approach uses language or linguistic performance to classify developmental language disorders. Miller (1987) used a linguistic framework to identify different types of speech and language deficits in school age children with developmental language disorders. The resulting subtypes were:

1. Sentence formulation difficulties
2. Word finding difficulties
3. Rate and fluency difficulties
4. Hyperverbosity
5. Pragmatic and discourse difficulties
6. Semantic and referencing difficulties

Crystal, Fletcher & Garman (1990) analysed the linguistic profiles of twenty four language impaired children between the ages of five and eleven years. The profiles were analysed according to the individual children's proportion of complex and phrasal structures, the number of syntactic and morphological errors and fluency rates. The analysis identified the following four groups:

1. A group with difficulties within semantics and pragmatics. No problems in syntax or fluency
2. A group with only rate and fluency difficulties.
3. A group with rate and fluency difficulties in addition to difficulties in generating phrase and clause structures.
4. A group with problems in generating phrase and clause structures.

The clinical, psychometric and linguistic approaches have identified different subgroups of developmental language disorders. Overall, the groups identified have included children with expressive or receptive deficits only and mixed expressive – receptive deficits. Within these three broad distinctions, children with deficits in syntax only, phonology only and syntax and phonology have been subclassified. Finally, a group with predominantly deficits in semantics and pragmatics has been singled out.

Validity of subtypes

Although attempts to classify different subtypes of developmental language disorders have been made, none have proved to be satisfactory. This is partly due to methodological difficulties. For example, the cohort that Rapin & Allen (1983) used was very heterogeneous in that it included a variety of children with speech and language impairments, e.g. children with autism who do not meet criteria for developmental language disorders. Intelligence data has also not been consistently reported. The tests selected in the psychometric approach seem to measure factors more associated with speech and language impairment (eg. auditory perception, auditory memory and visual memory) rather than directly addressing the speech and language behaviours (e.g. expressive syntax). Pragmatic language behaviours were not assessed within the psychometric approach. Miller (1987) tends to focus on expressive language rather than receptive language. Crystal et al (1990) seem to be more concerned with syntax difficulties rather than the other linguistic areas such as semantics and pragmatics which can also be impaired in children with developmental language disorders.

However, different subgroups of developmental language disorders have been identified by the varying approaches discussed. One subgroup has received considerable attention due to its overlapping behaviours with autism and autistic spectrum disorders. These are children subtyped as semantic pragmatic disordered.

The identification of a *semantic pragmatic syndrome* as a subtype of DLD by Rapin & Allen (1983) and to some extent Miller (1987) was supported by Bishop & Rosenbloom's (1987) description of a semantic-pragmatic disorder. Bishop & Rosenbloom (1987) characterised this disorder as delayed early language development, which then develops into fluent, complex speech with clear articulation. Although receptive difficulties may dominate in the development of these children, they might improve considerably and do well on multiple choice comprehension tests. Comprehension problems are still evident in less structured situations, when the children tend to give overliteral or tangential responses. Unlike other language impaired children, those with this language profile tend to have mild autistic features, but these are typically not severe enough or extensive enough to warrant a diagnosis of autism.

Again, Rapin & Allen's study (1983) of a 120 children identified as having autism and developmental language disorder is integral to the argument of a semantic pragmatic disorder as a subtype of DLD. In this study, each child's disorder was categorised in terms of the type of language impairment observed and whether or not the criteria for autism were met. Developmental language disorder and autism were not regarded as mutually exclusive and both conditions could be coded as present. Rapin and Allen (1983) reported that semantic pragmatic syndrome was commonly

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1.2.4) SUMMARY

The recognition of the diverse nature of DLD enables further understanding into both the nature, outcome and remediation approaches to DLD. The few classification systems of DLDs have shown that subtypes do exist and that the communication problems of some children with DLDs are not associated in any way with social and behavioural abnormalities. However, there are some children who, while not fitting the diagnostic criteria for autism, show some autistic features in conjunction with language difficulties and these are typically those with the clinical picture of semantic pragmatic disorder.

The preliminary classifications of DLDs are useful as they show that this group is not homogeneous in their speech and language impairments. Children who fall into one subtype, e.g. semantic pragmatic syndrome may have a different developmental trajectory to other subtypes. Causal deficits may be identified in one subtype but not replicated across others. Finally, subgroups may require different intervention approaches to maximize clinical and educational input.

Historically, the simple dichotomies separating receptive and expressive language development and delays from disorders have had to develop into complex analyses of presenting speech and language behaviours which characterise developmental language disorders. The aim of defining and classifying developmental language disorders is to determine stability of diagnosis, longitudinal progression and information regarding prognosis. Longitudinal studies serve an important role in establishing the predictive validity and prognosis of subtypes of developmental language disorders.

Defining and classifying developmental language disorders is and has been a difficult task. They are not well understood due to their varying presentations, the existence of subgroups and the lack of an apparent aetiological or functional cause. Studies, particularly longitudinal follow ups of developmental language disorders need to ensure their samples are homogenous with respect to the current criteria needed to diagnose developmental language disorders. Within this diagnosis, it is essential that subgroups are identified according to their speech, language and social behaviours. Longitudinal studies of homogenous subgroups will help to identify accurate and specific cognitive profiles, developmental trajectories and determine final adult outcome.

SECTION 1.3: EXPLANATORY THEORIES OF DEVELOPMENTAL LANGUAGE DISORDERS

To date, developmental language disorders (DLDs) have not been attributed to an identifiable aetiological or functional cause. However, research has been conducted in an attempt to identify a possible underlying deficit or cause, which could explain the speech, language and communication impairments found in this population.

The underlying deficits identified to date can be grouped into non – linguistic and linguistic categories:

1. *Non-linguistic* deficits are concerned with aspects of speech and language development, which are not inherently linguistic. These include symbolic functioning and conceptual development, auditory processing and phonological processing.
2. *Linguistic* theories are concerned with hypothesised innate cognitive mechanisms which are specialized to linguistic processing. These mechanisms operate in normal language development but are thought to be impaired or dysfunctional in developmental language disorders.

The divide into non –linguistic and linguistic categories is further complicated by whether the possible underlying deficits have a causal or common association to the developmental language disorder. In addition, there is the role of social cognition to consider which is neither solely a linguistic or non linguistic deficit.

1.3.1) NON-LINGUISTIC DEFICITS

Symbolic function

The term symbolic function refers to the ability to use a symbol to represent a concept or idea. Children with developmental language disorders have been described as

lacking a symbolic function and therefore having a general representation deficit, which affects a variety of kinds of symbolic functioning.

Such a premise stems from cognitive theories of language development (Piaget & Inhelder 1971) where the sequence and development of cognitive abilities is thought to determine language development. For example, when a child has acquired the skill of object permanence this then signifies that the child can generate internal mental representations that are required for symbolisation (Piaget & Inhelder 1971). Thus, a child has developed the ability to realise that words are symbols which can represent objects, actions and concepts etc. This theory is largely based on the observation that for the majority of normal children, the appearance of symbolic play coincides with the emergence of a child's first words (Bates 1979).

Symbolic play has been defined as the ability to use an arbitrary sign to represent a concept or idea and to form and manipulate mental representations with increasing sophistication (Lewis, Boucher, Lupton et al 2000). Studies of symbolic play have identified that language impaired children have inferior symbolic abilities to their chronological age matched peers (Thal & Bates 1988, Terrell, Schwartz, Prelock & Messick 1984) but show more superior symbolic play abilities to language matched peers (Skarakis & Prutting 1988, Thal & Bates 1988, Roth & Clarke 1987). This disproves the symbolic function theory as the symbolic play abilities of language impaired children are superior to their language abilities. Language impaired children do seem to acquire the symbolic function and therefore a deficit in symbolic function cannot adequately explain their impairment in language development.

Conceptual development

Children with developmental language disorders usually perform better on performance intelligence (IQ) tests than verbal IQ tests and language tasks. This discrepancy in performance has been interpreted to suggest that the underlying conceptual skills of DLD children are intact. Instead, their problems in language development are a result of problems in learning the verbal forms used to refer to concepts rather than there being any major conceptual limitation.

An interesting study by Kamhi (1981) examined children with developmental language disorders, mental age matched controls and language age matched controls. Each child was given six conceptual and reasoning tasks within the domains of space, logic, imagery, class and number. The study found that the developmental language disordered group performed consistently better than the language matched group but consistently poorer than the age matched peers. Kamhi (1981) concluded that the conceptual abilities of the developmental language disordered children are less delayed than their language abilities therefore a conceptual deficit cannot explain their linguistic deficits. This lends further support to the nature of developmental language disorders as more complex than simply being attributed to symbolic or conceptual deficits.

Auditory processing

Language impaired children have been found to have difficulty perceiving rapidly presented changing acoustic information, resulting in the temporal processing deficit hypothesis as an explanatory deficit of developmental language disorders:

“Deficits in basic neuropsychological processing particularly auditory temporal processing, may contribute to deficits in the development of productive as well as receptive aspects of speech communication”. Tallal, Stark and Mellits 1985

The temporal processing deficit hypothesis is the result of much empirical evidence (Tallal, Stark, Kallman & Mellits 1981, Tallal & Stark 1981, Tallal 1976, Tallal and Piercy 1975). Tallal & Piercy (1975) designed an experiment to determine whether language impaired and control children could discriminate between different sounds by varying the length of time between the presentation of the sounds. When the interval was shorter, the performance of the language impaired group was inferior to the controls. When the interval was longer, the language impaired group's performance improved.

In a further study, Tallal (1976) assessed groups of language impaired children and normally developing language children between the ages of four and nine years and normal adults. The groups were assessed on an auditory processing task where the rate of the presentation of the stimulus varied. The performance of the language impaired children was significantly poorer than even the four and half year old normal children on rapidly presented auditory sequences. When the patterns were presented at a slower rate the language impaired group were not significantly different from

normal children their own age or the adults indicating that DLD children have difficulty perceiving rapidly presented changing acoustic information.

The majority of research investigating auditory processing deficits has concentrated solely on children. Relatively few studies have examined the pattern of these deficits in adults with the exception of one study by Lincoln et al (1992) who investigated auditory processing deficits in three young adult groups, a group with developmental language disorders, autism and normal controls. All three groups performed near ceiling levels on a task which involved only two stimuli presented at rapid rates of presentation. The deficits of the language impaired adults became apparent when the number of different tones increased regardless of whether the tones were presented at a slow or fast rate. The study concluded that compared to an autism group and a control group, the DLD adults had difficulty perceiving acoustic information.

To date, studies have found that on auditory processing tasks where the stimuli are either brief or rapid, children with language impairment have difficulty in discrimination. However, when the same stimuli are lengthened or presented at a slower rate they have less difficulty in differentiating. These processing deficits are thought to have a severe impact on language development where language development is dependent on the ability to distinguish and identify brief and rapid auditory events. This process is termed a bottom up approach to language development where children need to hear and process speech and language in order for their speech and language to develop. If children have an auditory processing deficit, auditory input is missed which subsequently affects both receptive and expressive language development.

Working memory

The term “short term memory” is used to refer to memory for events that occurred in the very recent past, where the delay between presentation of the material to be remembered and remembering is measured in terms of seconds and minutes rather than hours or days (Gathercole 1998). In this section, the focus will be on the working memory model within short term memory with particular attention to the phonological loop component and its role in language abilities and language development.

Baddeley (1986) defines the term working memory as a system that has evolved for the short term maintenance and manipulation of information necessary for the performance of complex tasks such as learning, comprehension and reasoning. The working memory model functions as an attentional control system which has three structurally distinct temporary storage devices. The central executive operates in conjunction with two subsidiary systems which are the phonological loop and the visuospatial sketch pad. The phonological loop is concerned with auditory and speech based information and consists of a phonological short term store and articulatory rehearsal. The visuospatial sketch pad maintains and manipulates visual and spatial information. The central executive is concerned with the processes involved in the attentional control of both these systems which are co-ordinated and linked to long term memory by the central executive.

The phonological loop consists of two subcomponents, a phonological store and a subvocal rehearsal process. Information gains access to the phonological store either

directly, via auditory presentation of speech stimuli or indirectly via internally generated phonological codes for nonauditory inputs such as printed words or familiar visual objects. Phonological representations of memory items decay rapidly in the phonological store and become indiscriminable within about two seconds if unrehearsed. Subvocal rehearsal occurs serially and in real time and acts to refresh decaying representations in the phonological store. In this way, decay of representations within the phonological store can be prevented if the entire contents of the store can be rehearsed within two seconds. The phonological loop is specialised for the representation and rehearsal of verbal input, a process which has been termed phonological processing. Non word repetition is a measure of phonological processing as it relies on the capacity of the phonological loop to encode and maintain the novel phonological sequence of the non word.

Psychological experiments have been conducted to try and support the separation of the phonological loop component within working memory. This has been done by establishing several effects: (1) The phonological similarity effect where phonologically similar items are recalled less well than phonologically unsimilar items. This confirms the hypothesis that information is held phonologically within the phonological store (Baddeley 1966). (2) The word length effect where the subvocal rehearsal of long words takes longer than short words, allowing more time for information in the phonological store to decay. This supports the existence of a separate subvocal rehearsal mechanism (Baddeley 1986). (3) The articulatory suppression phenomenon where the word length effect is obstructed when subvocal rehearsal is prevented (Baddeley et al 1975).

It is the phonological loop component of working memory which is important in the study of developmental language disorders. Within the phonological loop, it is hypothesised that phonological representation within the phonological store is impaired (Gathercole & Baddeley 1990).

Gathercole & Baddeley (1990) investigated this phonological loop component, by comparing children with developmental language disorders to language and age matched control children. Each DLD child was matched to a performance IQ control and a verbal matched control. The children were assessed on nonword repetition, serial recall, phonological similarity, the word length effect, phonological perception and articulation rate.

Overall, Gathercole & Baddeley (1990) found that on the tasks of non word repetition and serial word recall, the DLD group performed more poorly than a younger group of normal children with equivalent vocabulary and reading skills and a group matched on age and performance IQ. Therefore, the memory deficits of the DLD group appeared not to be a consequence of their poor vocabulary and reading level. The analysis showed that this deficit was also not a result of impairments in auditory perceptual processes, a failure to encode input phonologically or a failure to use subvocal rehearsal. It was therefore hypothesised that children with DLD have a specific impairment in phonological working memory.

Gathercole (1995) proposes that the test of nonword repetition is primarily a test of phonological working memory skills. It relies on the capacity of the phonological memory system to encode and maintain the novel phonological sequence of the

nonword. An adequate temporary representation of a new word is needed so that a long term stable memory representation can be constructed so that it can then become part of the individual's vocabulary. Such a process is thought to take place in normal vocabulary acquisition (Gathercole 1995). Therefore, the greater an individual's phonological memory capacity, the more readily he is able to recall nonwords and establish long term representations of the sound structures of new words. Gathercole (1995) hypothesises that this process is how children increase their receptive and expressive vocabulary.

A relationship between vocabulary development and non word repetition has been identified in normally developing children (Gathercole & Baddeley 1990). In a longitudinal study of normal four to five year old children, it was found that scores on the Children's Test of Nonword Repetition (Gathercole, Willis, Baddeley et al 1994) were highly associated with their receptive vocabulary scores. In addition, Baddeley & Wilson (1993) found that adults with very poor nonword repetition skills had great difficulties in learning phonologically unfamiliar names but not familiar ones.

The specificity of nonword repetition has been raised. It is not yet certain whether long term lexical knowledge is also involved in addition to phonological processing. Gathercole (1995) assessed seventy children at ages four and five years on memory span, nonword repetition, vocabulary and reading. The nonword repetition task consisted of words which were rated into low or high word likeness. Gathercole (1995) tested the hypothesis that repetition accuracy for nonwords that are low in word likeness will be more highly associated with short term memory span than repetition accuracy for nonwords with high word likeness. This stems from the

lexicality effect where nonwords are recalled less well than real words and therefore lexical knowledge is thought to facilitate recall. Gathercole (1995) found that at both ages repetition was better for nonwords with high word likeness than low word likeness. This was taken to show that non word repetition for low word likeness involves phonological processing to a greater degree than non words with high word likeness which is helped by long term lexical knowledge.

Overall, children with DLD have been found to show particular difficulties in phonological processing as measured by nonword repetition in comparison to language and age matched peers. This suggests that some children with DLD have poor phonological processing abilities which are detrimental to their language development, particularly vocabulary acquisition. Although the evidence from Gathercole & Baddeley (1990) is extremely interesting, it is based on a limited data set. However, recent studies have both replicated and validated their results.

Stothard, Snowling, Bishop, Chipchase & Kaplan (1998) followed up a group of specific language impaired (SLI) children into adolescence. At five years this group was subdivided into a general delay group with a performance IQ below 70, a resolved SLI group who had reached satisfactory speech and language abilities and a persistent SLI group with a performance IQ above 70. At fifteen years they were assessed on a variety of measures including a nonword repetition test. Significant group effects were found across all the tests but more interestingly, performance on the nonword repetition test of the persistent SLI group and the resolved SLI group was significantly poorer than the controls. Therefore, impairments in phonological processing were found in children with persistent language impairments which

correlated with their language impairments and in children with resolved language impairments. This suggests that a test of nonword repetition is also a sensitive indicator of residual language impairment.

Bishop, North & Donlan (1996) assessed phonological processing in resolved and persistent language impaired monozygotic and dizygotic twins in childhood. Those twin children with resolved language impairment and persistent language impairment were significantly impaired on non word repetition. The resolved language impaired group was found to still have impaired phonological processing even though they had developed adequate language abilities. In the persistent language impaired group, impaired phonological processing was strongly correlated to their language impairment. Further analysis indicated an increased susceptibility to impaired phonological processing in language impaired monozygotic twins. As a result, phonological processing was put forward as a marker for the phenotype of heritable forms of developmental language impairment.

1.3.2) LINGUISTIC DEFICITS

A direct challenge to the hypothesis that DLD children have impaired phonological processing comes from the more linguistic approach to developmental language disorders. The linguistic approach refers to the role of innate mechanisms specialised to linguistic processing which are hypothesised to be impaired in children with developmental language disorders. The importance of the linguistic approach falls within the development of grammar and syntax and the methods or strategies that normally developing children use to learn the rules of a language, and how this can be impaired.

A sentence comprehension strategy is a short cut used to gain meaning from a sentence without using all the information available within that sentence. The use of such strategies aids language development and is eliminated at certain stages in language development. An example is the word order strategy. By the age of four years, children generally use a word order strategy where a noun-verb-noun sentence such as “The car hits the lorry” is interpreted correctly as agent – action – object. The use of this strategy leads children to reverse the meaning of more complex reversible passive sentences such as “The car is hit by the lorry”. A child using the word order strategy would still interpret this as the car hits the lorry. So it is the surface syntactic structures that the child pays attention to rather than the deeper syntactical structure.

The probable event strategy is where a child relies on his existing knowledge of word meanings and experience of events in his world to aid his understanding. Therefore, a child will understand a sentence in terms of the most probable interpretation and ignore the syntactic structure. For example, in the following negatively biased sentence “The hat wears the dog” the child will ignore the syntactic structure and understand it as “The dog wears the hat” as this is the most probable interpretation. The use of these strategies decrease as the normal child’s language develops but according to the linguistic approach children with DLD can persist in their use of such strategies or use them in a different way compared to language and age matched peers.

Van der Lely & Dewart (1986) investigated the use of sentence comprehension strategies in children with developmental language disorders. Eleven children with

DLD were matched to eleven age matched and eleven language matched controls. They had to act out active and passive voice sentences that had either a positive or negative semantic bias or were semantically unbiased.

The positive and negative semantic biased sentences aimed to assess the word order strategy. The unsemantically biased sentences aimed to assess the probable event strategy. The children with DLD performed at a significantly lower level than both the control groups, relying more heavily on semantic cues and always using the probable event strategy for the semantically biased sentences. The DLD group also used the word order strategy to a greater degree in the acting out of both active and passive unsemantically biased sentences. Van der Lely & Dewart (1986) concluded that these children with DLD based their interpretation on semantic cues or the sequence of words and relied little on syntactic information. They were still using comprehension strategies that the control groups were not suggesting that the DLD children had difficulty eliminating comprehension strategies in their language development.

Van der Lely & Howard (1993) also investigated a group of DLD children to determine if they had short term memory impairments or linguistic impairments which could explain their language deficits. Six children with developmental language disorders were matched to a younger language matched control group on standardised assessments of receptive and expressive abilities. One DLD child was matched to three control children. The ages of the DLD group were between six and ten years and three and seven years for the controls. Two tasks were used to assess the influence of semantic, lexical and phonological factors of short term memory.

On a task designed to investigate whether semantic processing was involved in the immediate recall of semantically similar and semantically unrelated words, the DLD group and the controls were both performing in similar ways and therefore the DLD group were not thought to be relying to a greater extent on semantic-cognitive processing than the controls for the short term storage and recall of words.

A significant lexicality effect was found for both groups in that nonwords were recalled less well than real words. However, no difference in performance was found between the groups on the recall of nonwords which is the opposite of what Gathercole & Baddeley (1990) found.

To assess phonological skills, the children were assessed on their ability to recall phonologically unrelated and phonologically similar words. No significant differences were found between the groups and both groups showed a phonological similarity effect. This indicates that the DLD children have a similar capacity and storage of phonological material to that of their language matched peers.

Van der Lely & Howard (1993) concluded that generally the DLD group performed at a similar level and were equally sensitive to the linguistic demands of the tests as the control group. Importantly, the DLD group was not found to be impaired in their recall of nonwords in comparison to the control group. This finding refuted the theory that children with DLD have an impaired capacity for phonological storage for the recall of nonwords.

Both linguistic and non linguistic categories of causal deficits in developmental language disorders have been discussed. However, the underlying deficit remains unknown. A working memory deficit, auditory processing deficit and a linguistic deficit have been described as the three most robust contenders for an underlying causal deficit in developmental language disorders. It is important to consider whether these deficits could cause, are only associated with or may be a result of the developmental language disorder.

With reference to cognitive causal association, the phonological processing deficit and the auditory processing deficits are strong arguments. Especially for the explanation of poor vocabulary development and comprehension problems and the heritability of non word repetition found in the twin study. However, it is difficult to see how they can explain the heterogeneity of DLD, i.e. those children who fall within a semantic-pragmatic category. In comparison, the linguistic deficit can really only account for DLD children with predominantly syntax acquisition difficulties. It is unclear whether there is a different problem causing the linguistic deficit, i.e. is there a cognitive causal explanation for the persistent use of an immature comprehension strategy. Therefore, a linguistic deficit is better placed as a common association to or a result of developmental language disorders.

1.3.3) SOCIAL COGNITION AND DEVELOPMENTAL LANGUAGE DISORDERS

Social cognition and theory of mind are broad terms that are used to convey the idea of understanding social interaction by inferring the beliefs, desires, intentions and emotions of others (Happé 1994, Astington 1998, Astington & Jenkins 1999). Extensive research into the social cognition abilities of individuals with autism and autistic spectrum disorders has been conducted (Happé 1994, Baron Cohen, Jolliffe, Mortimore & Robertson 1997). Social cognition has recently gained importance in the study of developmental language disorders. Subgroups of individuals with developmental language disorders are thought to have social behaviours which overlap with autism and autistic spectrum disorders.

Background

In 1985, Baron – Cohen, Leslie & Frith proposed that a theory of mind deficit constituted the core deficit of autism. This deficit being an impairment in the ability to appreciate that other people’s beliefs might differ from one’s own. This theory was considered rather innovative as it could explain the combination of social and cognitive deficits characteristic of autism, in particular the lack of social reciprocity and social competence (Happé 1994, Tager – Flusberg 1993, Baron – Cohen et al 1997). However, within the field of autism, this deficit has not yet been able to account for all of the behaviours (language abnormalities, stereotyped behaviours, mental retardation and the unusual islets of ability) that constitute the symptomatology of autism.

Tager – Flusberg (1993) proposed that the ability to know and understand the contents of other people's minds with respect to their thoughts, beliefs, feelings and desires is dependent on language. Language refers to the verbal form of communication and theory of mind is a cognitive ability that enables an individual to understand others' ideas, thoughts, beliefs and desires. Language ability is involved in theory of mind because it is the medium through which theory of mind is understood and expressed and perhaps develops. Furthermore, theory of mind is predominantly examined by using verbal tasks and it is the verbal responses and verbal explanations from subjects that are analysed in order to understand their theory of mind and the degree to which it is intact or impaired. Recently, language and social cognition have been investigated to explore the nature and extent of their association.

Astington & Jenkins (1999) repeatedly assessed normally developing children on measures of language and theory of mind over a seven month period and found theory of mind and language were associated with each other and with age. The analysis of the longitudinal relationship revealed that theory of mind abilities were able to predict language development but language development could not be predicted by theory of mind ability. The authors used these findings to suggest that linguistic ability is required for successful performance on theory of mind tasks, that language is fundamental to theory of mind and theory of mind is impossible without intact language ability.

Astington & Jenkins (1999) also raised the importance of the theory of mind tasks themselves. There are no standardised measures available to assess theory of mind and tasks used by researchers are therefore experimental with very little normative

data available. This means that different tasks do not necessarily correlate with one another and therefore it is debatable whether all theory of mind tasks are measuring the same cognitive ability independent of the effects of intelligence, language and memory. Furthermore, because the majority of theory of mind tasks are verbal, successful performance requires a certain level of linguistic skill.

Social cognition and language

Some debate in the literature has taken place as to whether social cognition and language are distinct or inter related abilities. Locke (1997) proposes that social cognition is the foundation of language acquisition arguing that language cannot develop unless an infant is able to engage in social cognition type behaviours. Studies of normally developing children have demonstrated the presence of early sociocognitive abilities shown in joint attention behaviours which are believed to form the foundation for language development. In contrast, studies of children with autism have identified that they tend not to engage in such behaviours which has subsequently been used to explain their lack of normal language development.

Leslie (1987) and Bishop (1997) claim that both language and social cognition are underpinned by basic shared cognitive processes such as the ability to form secondary mental representations or the ability to process information effectively so that both linguistic and sociocognitive mental representations can develop. Theoretically, a deficit in information processing could result in impaired language, impaired social cognition or both.

The final hypothesis proposes that language and social cognition are separate independent strands of development and any links between them are accidental and are simply because both are involved in successful communication (Frith & Happé 1994, Sperber & Wilson 1986). This hypothesis maintains that the development of language and social cognition are independent of one another.

Social cognition and language impairment

Language impairments are present in both autism and developmental language disorders. These language impairments are qualitatively different and language impairments in autism are only one symptom of the disorder. Yet, adults with autism and developmental language disorders both present with impairments in social competence which are characteristic of social cognition deficits (Howlin et al 2000, Mawhood et al 2000, Cantwell et al 1989: Bartak et al 1975).

In 1975, Bartak, Rutter & Cox hypothesised that autism was the consequence of a severe language deficit where the language deficit constituted a fundamental component of the cognitive basis of autism. This hypothesis led to a longitudinal comparison of boys with autism and boys with severe developmental language disorders. The comparison formed the first three phases of this current study. The hypothesis that language impairment was a core deficit of autism was disproved (Howlin et al 2000, Mawhood et al 2000).

Even though autism and developmental language disorders were found to constitute two different diagnostic groups, some overlap in behaviours has been identified. Developmental language disorders include a subgroup of children who present with

primary difficulties in the social use of language, termed pragmatics. It has been argued that children with semantic-pragmatic disorders and pragmatic impairments should be included on an autistic continuum as this is a group that are diagnostically close to autism (Bishop 1989).

The identification of pragmatic impairments in developmental language disorders has questioned whether these children also have deficits in social cognition, which can explain their difficulties in language and communication development (Bishop 1997). Bretherton, McNew & Beeghly – Smith (1981) and Tager-Flusberg (1993) argue that theory of mind is first evident in humans with the onset of intentional communication at approximately 9 months. Theory of mind develops from birth to five years which is also the major period of language acquisition and therefore suggests a relationship between these cognitive abilities. In children with autism, these behaviours are very often absent (Baron – Cohen 1989, Mundy, Sigman & Kasari 1990 Sigman & Mundy 1989) but are thought to be significant in language development. Unfortunately, there is no research to date that has explored the presence of joint attention and shared reference behaviours in infants with a history of or a current diagnosis of developmental language disorder.

Children with pragmatic impairments are thought to have particular difficulties in understanding non literal language, using context to aid understanding and therefore infer relevant information and the understanding of conversational topics which do not have concrete referents. These difficulties result in poor understanding in conversational situations which can lead to limited social reciprocity and ultimately poor social competence. For example, these children often give too much or too little

information within a conversation as they appear to be unaware of the needs of their conversational partner.

To date, few studies have focused specifically on the pragmatic comprehension abilities of language impaired children. Bishop & Adams (1992) compared children with specific language impairments (SLI), semantic pragmatic deficits (SPD) and controls on tasks where descriptive and inferential questions had to be answered. The inferential questions required the ability to understand more than the information explicitly stated. The results were not entirely conclusive. The SLI and SPD children had a significantly poorer overall performance than the controls but neither group could be differentiated by the descriptive or inferential questions. On the inferential questions, the SPD children had more difficulties than the SLI children but this failed to reach significance.

Farmer (2000) investigated the relationship between language impairment and the development of social cognition. Language, phonological short term memory, social cognition and social competence abilities of two groups with specific language impairment, one group attending a special school and the other attending integrated educational placements were compared with chronological and language age matched controls. Farmer (2000) found that children with specific language impairment attending special schools had significant difficulties on social cognition tasks. These findings led the author to conclude that language impairment is associated with impairments in the development of social cognition. But the level of language development and level of sociocognitive development are not directly related. More interestingly, the SLI children attending integrated placements did not have

significant deficits in social cognition. Farmer proposed that it could be the lack of normal social experience or experience of negative or limiting social encounters that by some mechanism compound the social cognition abilities of SLI children in special schools. Farmer concluded that it is possible to subgroup SLI children with and without social cognition deficits but most importantly that not all SLI children present with impairments in social cognition.

This subgrouping of SLI children by social cognition ability is supported further by Shields, Varley, Brooks et al (1996). SLI children with language impairment only in the semantic and pragmatic components of language were impaired on social cognition tasks. However, children with phonological and syntactic difficulties performed similarly to normally developing children on the same tasks. Cohen, Menna, Vallance et al (1998) found that a group of children with SLI referred to psychiatric services because of behavioural difficulties showed greater deficits in sociocognitive processing than children without language impairments who were also referred to the clinic. These studies of SLI children and social cognition have found that there is an association between the two abilities for some children and these tend to be those children presenting with behavioural difficulties and impairments in the semantic and pragmatic components of language. A substantial amount remains unknown about the relationship between language impairment and social cognition.

1.3.4) SUMMARY

Explanatory theories of developmental language disorders have been discussed within non linguistic, linguistic and social cognition deficits. Distinctions have been made between causal and associated deficits. Phonological processing has been put forward as a strong contender for a causal deficit in poor vocabulary development. Linguistic deficits are categorised as associated deficits which are theorized to be a consequence of the impaired language development.

Social cognition deficits have arisen from the identification of a subgroup of developmental language disorders that present with social cognition and/or pragmatic language impairments which overlap with the diagnostic behaviours of autism and autistic spectrum disorders. Social cognition deficits are able to explain the social behaviour and social competence difficulties found in developmental language disorders.

The adults with developmental language disorders involved in this present study were assessed on social cognition tasks to try and determine the association between their language impairments and difficulties in social competence. If language and social cognition are linked, it should follow that the DLD adults have impairments in social cognition in addition to their language impairments which could contribute to explaining any difficulties in social competence. Phonological processing and social cognition are proposed as two cognitive causal theories in developmental language disorders.

SECTION 1.4: THE LONGITUDINAL PROGRESSION OF DEVELOPMENTAL LANGUAGE DISORDERS

Relatively few systematic follow up studies investigating the longitudinal course of developmental language disorders have been carried out. Such studies have tried to show the relationship between developmental language disorders and later educational achievement, vocational status and social adjustment. An overview of these follow ups will be given to briefly describe the differing methodologies of the studies and to help in the interpretation of results. These follow up studies will then be discussed with reference to outcome within the domains of intelligence (IQ), language functioning, academic ability, other cognitive functions and social adaptation. A range of terminology has evolved to refer to children this study calls developmental language disordered (section 1.3). Rather than changing the terms used in the previous follow up studies, they are used synonymously with developmental language disorder (DLD) unless otherwise stated.

1.4.1) OVERVIEW OF FOLLOW UP STUDIES

Table 1.4.1 summarises the follow up studies conducted to date. The table includes information pertaining to the characteristics of the samples studied, age at follow up, areas assessed, the assessments used and a brief summary of the main findings.

The time at which the follow up assessment took place has varied from middle childhood to very early adult life. The methodology of the follow up assessments has also varied with respect to the number of participants, the use of controls and the type

Table 1.4.1 Summary table describing follow up studies of developmental language disorders

Study	Age at follow up	Participants	Main assessment areas	Summary of findings
Aram & Nation (1980)	4 to 10 years Mean age 7 years and 11 months	63 with an initial diagnosis of language disorder but a very heterogeneous sample	Information obtained from: Child's preschool clinical record Parent questionnaire Teacher questionnaire	<ul style="list-style-type: none">Continue to present with speech, language and academic difficulties
Aram, Ekelman & Nation (1984)	13-17 years Mean age = 14 years and 10 months	20 with an initial diagnosis of DLD	IQ Literacy Academic outcome Language Social adjustment	<ul style="list-style-type: none">5/20 in special educational provisionPersistent deficits in language and academic abilitiesLess socially competent than peersMore behavioural problems than peers
Hall & Tomblin (1978)	22-23 years	18=DLD 18=Articulation impaired	IQ Literacy Basic academic abilities	<ul style="list-style-type: none">50% of the language impaired group were perceived by their parents to have a communication problem compared to one of the articulation impaired group.Lower levels of academic achievement in the language impaired group than the articulation impaired group.
King, Jones & Lasky (1982)	13 to 21 years	50 with an initial diagnosis of a communication problem subdivided into: 5 = no verbal communication 18 = Language disorder/delayed 18 = Articulation problems 7 = language and articulation 2 = Articulation and fluency	Telephone interview eliciting information pertaining to: Residual communication deficits Psychosocial development Motoric skills Educational achievement	<ul style="list-style-type: none">Continuation of residual communication problemsAn initial diagnosis of a language problem at highest risk for problems later in lifeAn initial diagnosis of articulation disorder appears to have the best prognosis.Problems in social relationships only for 4 subjects initially diagnosed as language disorder/delayed speech
Oki & Cho (1996)	Early adolescence	N=102 including: DLD Mental retardation Autism Hearing impairment	IQ Verbal comprehension Stability of diagnosis Educational placement	<ul style="list-style-type: none">Lower IQ for those with more global impairments and pervasive language impairments

Table 1.4.1 continued

Paul & Cohen 1984	Adolescence. Mean age of 14 years and 2 months	11= DLD 7 = “atypical DLD”	Receptive & expressive language PIQ	<ul style="list-style-type: none">• Slow language development• More progress in expression than comprehension• PIQ highly correlated with language ability
Stern, Connell, Lee & Greenwood (1995)	Middle Childhood	N = 50 including: Language disorder Speech disorder Mixed speech and language disorder	IQ Academic ability Language Social behaviour	<ul style="list-style-type: none">• All 3 groups significantly impaired in areas in comparison to their PIQ• No problems in social behaviour
Stothard, Snowling, Bishop, Chipchase & Kaplan (1998)	15-16 years Mean age = 15 years and 7 months	DLD group =30 Resolved group =26 General delay group=15	IQ Receptive & expressive language Literacy Phonological processing Verbal short term memory	<ul style="list-style-type: none">• Resolved group showed residual language deficits• DLD group showed a poor outcome compared to the resolved group especially in language and literacy• Some measures were unable to differentiate the DLD and general delay groups
Tomblin, Freese & Records (1992)	17-25 years Mean age = 21 years and 5 months	35= initial diagnosis of DLD 35 = non language disordered controls	IQ Language Verbal short term memory Literacy	<ul style="list-style-type: none">• The DLD adults differed on all the language measures compared to the controls

of assessment conducted.

One of the most comprehensive follow ups into adolescence has recently been completed by Stothard et al (1998). A group of 87 children with speech and language difficulty were originally recruited at the age of four years old. At this initial assessment, 85 of the 87 children were classified as exhibiting a clinically significant and severe language delay.

Nineteen (22.4%) of these 85 children had an IQ score more than 2 standard deviations below the mean and therefore were termed a general delay group. The remaining 66 (78%) children had scores within the normal IQ range and were therefore classified as a specific delay or specific language impairment (SLI) group. A follow up approximately 18 months later when the children were about five and a half years old found that 30 (44%) of the 68 SLI group and 2 of the general delay group no longer met the criteria of language disorder. These children were therefore termed a resolved SLI group.

The general delay group (N = 15), the resolved SLI group (N = 26) and the persistent SLI group (N = 30) were followed up into adolescence. All three groups completed measures of intelligence, literacy, receptive and expressive language, phonological processing and verbal short term memory. Their functioning was compared to a cross sectional control group.

Aram & Nation (1980) followed up 63 children initially diagnosed as language disordered but included children with other impairments at the age of 2 years and 5

months. The mean age at follow up was 7 years and 11 months. No standardised assessments were administered, instead information about the children's language and academic functioning was obtained from the children's pre-school clinical record, a follow up parent questionnaire and a follow up teacher questionnaire.

Aram, Ekelman & Nation (1984) assessed a group of 20 adolescents originally studied 10 years earlier as pre-schoolers with developmental language disorders. The areas of language, intelligence, academic achievement and behaviour were investigated. Their criteria for diagnosing developmental language disorders included an absence of hearing impairment and neurological or craniofacial abnormalities. The IQ scores of this group at the initial assessment ranged from 60 to 122 where 2 children were unable to complete the task and therefore not all these children were within the considered normal IQ range. This suggests that not all these children met the definition of developmental language disorder.

Paul & Cohen (1984) followed up 18 "aphasic" children. Initially, this group was subdivided into 11 children with DLD and 7 children with atypical DLD (ADLD). Atypical DLD referred to those children who in addition to language disorder showed social withdrawal, poor social relations and some of the motor and sensory symptoms of autism including rocking, stereotypic behaviour and unusual responses to stimuli. However, none of these 7 children satisfied the full diagnostic criteria for infantile autism. The participants completed language and cognitive assessments at the follow up age of 14 years and 2 months. As a result of the follow up assessment, the 18 participants were further subdivided into 4 DLD participants with high IQs (i.e. in the normal range), 7 DLD participants with low IQs and the ADLDs who all had low IQs.

For the purpose of this section only the 4 DLD participants with high IQs will be discussed, as they are the only group to fulfil the criteria of developmental language disorders (World Health Organisation (WHO) 1993).

Hall & Tomblin (1978) followed up 18 DLD children and 18 articulation impaired children into their early 20s. A mixture of standardised intelligence and limited language assessments and communication ratings from parents were carried out. Only the profiles of the adults with DLD will be primarily included in the discussion.

A comprehensive Japanese follow up used 102 children described as having delayed language development (Oki & Cho 1996). At the age of 3 years they were divided into a group with delayed development in expressive language only, a group with delayed development in verbal expression and comprehension, and a group with delayed development in verbal expression and comprehension and communication. The follow up into adolescence focused on intelligence measures, stability of diagnosis and educational placement. This was a very heterogeneous group including children with diagnoses of developmental language disorders, mental retardation, autism and hearing impairment.

An Australian follow up of 50 children attending a language unit with diagnoses of language disorder, speech disorder and mixed speech and language disorder were assessed in middlechild following an initial pre-school assessment (Stern, Connell, Lee et al 1995). The assessment covered the areas of intelligence, language, academic ability and social behaviour.

Tomblin, Freese & Records (1992) assessed 35 adults with a well documented history of DLD on various measures both over the telephone and in a face to face setting. Their results were compared against a control population of 35 normal language users. The aim of the study was to find a set of diagnostic measures that could differentiate young adults with a history of DLD from adults with no history of language problems.

King, Jones & Lasky (1982) followed up 50 children in adolescence and early adulthood who had an initial diagnosis of communication impairment. These 50 children were classified into the categories of no speech/language/verbal communication (n=5), language disorder (n=18), articulation difficulties (n=18), language and articulation problems (n=7) and articulation and fluency problems (n=2). Again, for the purpose of this section, it is the 18 children who were placed in the language disorder category who will be referred to. King et al (1982) were unable to use any standardised assessments and the information was collected using a telephone interview with the parents of the participants aiming to obtain information regarding the communication status, educational achievement and psychosocial development of the participants.

The majority of the follow up studies investigating into the outcome of developmental language disorders have been retrospective in nature. Thus the participants were first seen at their follow up age which means information on their early diagnosis and language status has been collated from the participants' clinical and school records without a thorough language and cognitive assessment in the preschool years. The prospective methodology employed by Stothard et al (1998) and Aram & Nation

(1984) are the only studies to have included an assessment at an initial diagnosis. This assessment information has obviously provided important and comparable data with that collected at the follow up.

Another consequence of these retrospective studies is that the information used to define the criteria of DLD has varied from study to study. Some studies have included groups of children who are highly variable in terms of their physical and intellectual status. For example Aram et al (1980) and King et al (1982) attempted to include all children seen in particular clinics during a given period irrespective of intellectual, motor or hearing impairments. Paul & Cohen (1984) in their follow up of “aphasic” children did not use normal performance IQ as criteria for DLD. Therefore, although these studies address language outcome, all included some children with serious concomitant disorders.

In addition, follow up data in most of the studies were obtained principally from parents or teachers responding to structured questionnaires or surveys. Information about the participants’ functioning was therefore based on parents and/or teacher report and not directly obtained from the participants.

Theoretically, longitudinal follow up studies of children with developmental language disorders have the potential to answer important research questions. Primarily, outcome can be established and the nature of the language impairment identified, i.e. whether the initial language impairment was simply a delay which resolved or a deficit which persisted. Using information about the presenting language behaviours at the initial assessment it is possible to predict what types of language disorder will

have inferior and superior outcomes with respect to both cognitive and social adaptation outcome.

Furthermore, the role of social cognition in developmental language disorders and its relationship to language can be examined both at “snapshot” assessments and over time. This will help to determine whether social cognition is a primary deficit which explains both poor language development and poor social adaptation or if it is a secondary deficit which develops as a result of poor language development and then adversely affects social adaptation.

Although there are many hypotheses to consider, not all follow ups pursue these. The findings from the follow up studies previously presented have been collated and are discussed with particular reference to those children who fit a diagnosis of DLD.

1.4.2) INTELLIGENCE

Not all the follow up studies have measured either verbal or performance intelligence (IQ) despite using participants with diagnoses of DLDs who by definition are expected to have normal performance (PIQ).

The follow ups which have used normal performance IQ as criterion at the initial diagnosis for DLD have found that it has remained within the normal range. Oki & Cho (1996) found that 77% of their group with delayed verbal expression which contained 25 cases of DLD obtained a full scale intelligence score (FSIQ) of more than 70. Almost 80% of the other two groups which together only contained 7 cases of DLD from 75 children scored below 70 on FSIQ. The 4 DLD participants with a

high IQ in the Paul & Cohen study (1984) gained a mean PIQ of 92.8 which is well within the normal range. Aram et al (1984) found that of 20 adolescents with a diagnosis of DLD, 70% gained FSIQs within the normal range. The DLD group in the Stothard et al (1998) follow up gained a mean PIQ well within the 80s. The 35 adults with DLD in the Tomblin et al study (1992) achieved a mean PIQ of 90.

Performance IQ has also been found to be consistently higher than verbal IQ in DLD groups (Stothard et al 1998). This was also replicated in the Aram et al study (1984) where 15 of the 20 adolescents had higher PIQs than VIQs.

Only one of the follow up studies has found deterioration in IQ over time. The mean initial PIQ score of 20 of the 35 DLD adults studied by Tomblin et al (1992) was 98.5. At the time of the follow up when the participants were in their early 20s this had deteriorated to 90. However, this may reflect a change in assessment from the WISC-R in childhood to the WAIS-R in adult life or may be a feature of DLD yet to be further investigated.

For those studies which have used a measure of intelligence at the time of follow up and valid criteria including normal performance IQ to diagnose DLD at the initial assessment then the evidence supports that DLD children have performance IQ scores within the normal range, that PIQ is usually higher than VIQ and IQ scores do not deteriorate over time irrespective of functioning in other areas.

1.4.3) LANGUAGE FUNCTIONING

Follow ups have used a combination of standardised receptive and expressive language assessments and parent/teacher ratings of communication and language ability. Overall, the follow ups have found that children with an initial diagnosis of DLD continue to show both residual receptive and expressive language impairments and overall communication deficits at the follow up assessment.

Stothard et al (1998) found that their SLI group did not differ from a general delay group on standardised receptive and expressive language measures when the children had reached a mean age of 15 years and 7 months. Both these groups obtained significantly lower scores than the cross sectional controls on the language measures. At the age of 15 years, 21 of the 30 SLI children were categorised as having impaired speech and language. Only 3 of the original group were deemed as having satisfactory speech and language ability.

Aram & Nation (1980) found that of their 63 children with a mean age of 7 years and 11 months, 40% were rated by their parents and teachers as continuing to exhibit speech and language problems. For example, 34.9 % had difficulty understanding sentences and commands and 41.3% showed difficulty in the ability to coordinate ideas and put words together into sentences.

Aram et al (1984) found that 18 of their 20 DLD adolescents presented with moderate to profound difficulties on the standardised assessments of receptive and expressive language. Scores on a test of language comprehension also correlated well with IQ

scores so that those participants with higher comprehension scores also had higher IQ scores.

Paul & Cohen (1984) used standardised receptive and expressive assessments to yield a language reception quotient (LRQ) and a language production quotient (LPQ) for the 4 adolescent DLD participants with high IQs. The mean LRQ was 80.8 and 84.3 for the LPQ. Although these scores were significantly higher than those of the DLD participants with low IQs and the ADLD children, they were still categorised as poor and therefore, the high IQ DLD participants were said to continue to have residual language problems.

Tomblin & Hall (1978) found that of their 18 language impaired young adults, 50% were perceived by their parents to have a communication problem compared to only one of the articulation impaired group.

Tomblin et al (1992) found that the 35 adult participants with initial diagnoses of language disorder performed more poorly on all the language measures compared to an adult control group. The language disordered group in the study by Stern et al (1995) were found to be impaired in their language abilities in middle childhood.

King et al (1982) found that 67% of the language disordered group were still reported by their parents as having language problems. This finding led King et al (1982) to conclude that those children initially diagnosed as having a language problem are at a high risk for continuing language problems into adolescence and young adulthood.

Both standardised and rating assessments have been included in the follow up studies. It is difficult to compare the findings of language assessments across the studies as they have used different standardised assessments and several studies have relied on parents and teacher rating of the participant's language and communication status. However, all of the studies have reported that children with an initial diagnosis of DLD continue to have both receptive and expressive language difficulties regardless of the age of the children at which the follow up has been carried out.

1.4.4) ACADEMIC OUTCOME

The 30 SLI adolescents in the Stothard et al study (1998) showed marked difficulties on the standardised literacy assessment, obtaining scores that were significantly lower than the resolved group and the cross sectional control group. Interestingly, the SLI group and the general delay group performed at a similar low level.

Aram & Nation (1980) found that 40% of their 63 children were rated by their teachers as having reading and maths ability below their age grade level. With regard to educational placement, 58% of the group were in mainstream classrooms, 11% in mainstream classrooms with younger children due to being kept behind their chronological peers for more than one year and 28% were in full time special educational provision.

The 20 DLD adolescents in the Aram et al follow up (1984) were assessed on a standardised assessment of reading, spelling and arithmetic achievement. Only 25% of the participants scored above the 50th percentile for reading and spelling, with well over half scoring below the 25th percentile. Maths scores were even lower with only

15% of the participants scoring above the 50th percentile and 80% scoring below the 25th percentile. With respect to educational placement, only 5 of the 20 adolescents were in regular classrooms and the remaining 15 in special educational provision ranging from extra teaching to full time special needs provision.

Of the 4 DLD participants with normal range IQs in the Paul & Cohen (1984) follow up, 2 of these were in special educational provision and the remaining 2 in mainstream education at the mean age of 14 years and 2 months. King et al (1982) found that 11 of the 18 language disordered group were experiencing academic difficulties within the areas of reading and spelling. This language disordered group were most likely to receive average grades of C or below and were most likely to have needed and received extra educational provision.

Tomblin & Hall (1978) used two measures of academic ability. Reports were obtained from parents regarding the highest level of education achieved by the subject and standardised results from academic assessments. All 18 of the language impaired adults were finishing or had finished high school but fewer of the language impaired group than the articulation impaired group went onto higher education. The standardised assessments of academic ability showed the language impaired group to score consistently lower than the articulation impaired group within the areas of number, reading, language and maths. However, with the exception of reading the language impaired group were found to be functioning close to the mean for the academic areas assessed. Reading was the poorest area of ability for the language impaired group. This rather positive academic outcome for the language impaired group may be due to biased sampling as the participants were initially recruited from

advantaged homes which the authors believe may have predisposed the participants to a greater opportunity for educational success.

The follow up studies which have investigated academic ability and educational placement have found a poorer level of ability in the DLD participants than control participants. The relationship between language disorders and later academic difficulties is not clear but DLD children do seem to be a greater risk for academic and educational problems further into their lives.

1.4.5) WORKING MEMORY

With the exception of Stothard et al (1998) and Tomblin et al (1992), none of the remaining follow ups have investigated areas of cognitive function other than intelligence, language, literacy and academic outcomes. However, the more recent studies have focused on other cognitive functions such as working memory within the cognitive profile of DLD. Much of this interest is centred on pre-school children when they initially present with DLD and not as they grow older. Whether these abilities resolve over time or remain as a persistent deficit in DLD needs to be determined.

Of particular interest, Stothard et al (1998) investigated phonological processing, phonological awareness and verbal short term memory ability in the general delay group, the SLI group and the resolved SLI group. All three working memory abilities are thought to be sensitive indicators of persistent and residual underlying language difficulties. The SLI group and the general delay group did equally poorly on these abilities compared to the resolved SLI and control groups. Interestingly, the resolved

group also performed at a significantly lower level than the controls on these phonological processing tasks suggesting that the resolved group had residual and persistent deficits in phonological processing.

Tomblin et al (1992) also assessed their 35 DLD adults on verbal short term memory. The DLD adults gained a mean score of 6 out of 14 compared to 11 for the control group. This difficulty of the DLD adults led Tomblin et al (1992) to suggest that their poor sentence repetition might be due to a short term verbal memory deficit.

Phonological processing deficits have definitely been identified in adolescents with DLD and possibly a verbal short term memory deficit in adults with DLD. This area needs further investigation to determine whether these impaired cognitive functions are a feature of all DLD children as they grow older.

1.4.6) SUMMARY

The relatively few systematic follow up studies of DLD children have found normal IQs which have remained relatively stable over time. Persisting expressive and receptive language impairments have been identified when measured on both standardised assessments and the existence of communication problems as perceived by others. Academic ability across the studies within the domains of literacy, maths ability and educational placement has also been poor. Subtle phonological working memory deficits have been identified in adolescents with DLD and adolescents with resolved DLD as well as possible verbal short term memory deficits in adults with DLD. Overall a relationship between DLD in children and later problems in life has been established.

Due to the differing methodologies of the studies it is difficult to compare their findings and come up with a robust and comprehensive profile of DLD further into adolescence and adult life. There is a need for future follow up studies to parallel one another more with respect to the age at follow up, the initial diagnosis, assessments used and assessment into areas other than intelligence, language and academic outcome.

The hypotheses initially presented by the follow up studies discussed have varied. Some have concentrated solely on the language behaviours and cognitive profile at outcome. Others have extended their remit to study social behaviours and academic outcome. This wider remit is obviously more valuable as it can address how developmental language disorders impact on overall functioning. Interestingly, none of the follow ups discussed have included indepth analyses of social cognition and social adaptation. Inclusion of such analyses would result in a more comprehensive profile aiming to determine the complex relationship between language, social cognition and social adaptation.

Follow ups which extend beyond middle childhood into late adolescence and especially adult life would be extremely valuable as then the true consequences of DLD could be measured. Follow ups into middle childhood and early adolescence have to take account of developmental factors in their analysis. In addition, areas such as employment success and adult social functioning could also be investigated once participants had entered adulthood.

The criteria for DLD have not been met in all of the studies, thus quite heterogeneous groups of children have been followed up. The use of both standardised assessments and descriptive measures in the follow ups have also made comparisons difficult. Furthermore, very few studies have broadened their assessment to include important areas such as memory and social cognition in the study of DLD outside of intelligence, language and academic achievement.

SECTION 1.5: THE RELATIONSHIP BETWEEN DEVELOPMENTAL LANGUAGE DISORDERS AND MENTAL HEALTH

The field of child psychiatry has played an important role in the study of the mental health of children with speech and language impairments. The limited number of studies that have explored the psychiatric functioning of children with speech and language impairments can be subdivided into population based studies, clinic based studies, cross sectional studies, longitudinal studies and prospective follow up studies. *Population based* studies analyse large groups of children from a general population sample and tease out the speech and language impaired children to observe their abilities. *Clinic based* studies may overestimate the true co-morbidity of psychiatric and language problems because children with multiple impairments are more likely to be referred. *Cross sectional* studies are those which look at the psychiatric functioning of speech and language impaired children at one point in time. *Prospective* studies follow up speech and language impaired children with and without known psychiatric problems to observe the course of their psychiatric functioning over time. Finally, *retrospective* follow up studies assess the psychiatric functioning of speech and language impaired children at one time point and compare back to previous reports of the child's functioning.

These types of studies will be described to discuss the prevalence of psychiatric disorders, relationships between speech and language impairments and psychiatric disorders, psychiatric outcome over time and finally explaining the possible links between speech and language impairments and psychiatric disorders.

1.5.1) PREVALENCE OF PSYCHIATRIC DISORDERS IN SPEECH AND LANGUAGE IMPAIRED CHILDREN

Studies have found a higher prevalence of psychiatric disorders in speech and language impaired children compared to children without speech and language impairments (Beitchman, Brownlie, Inglis et al 1996, Baker & Cantwell 1987a, Baker & Cantwell 1987b, Beitchman, Nair, Clegg et al 1986, Baker and Cantwell 1982, Cantwell, Baker & Mattison 1981). Table 1.5.1 gives a summary of studies to date.

In a cohort of 535 children, a low score on a measure of language at 3 years of age was found to be related to a high rate of neurotic deviance at 8 years of age (Stevenson, Richman & Graham 1985). A similar finding was replicated in the epidemiological study by Fundudis et al (1979) where the children in the sample who were described as speech retarded showed an increase in behavioural deviance and introversion as measured by a teacher questionnaire. Silva et al (1984) assessed a large group of New Zealand children at the ages of 3, 5 and 7 years. The assessments showed that at the age of 7 years, there were significantly more behavioural disorders in the children identified as language delayed.

In a cross sectional community sample study of 1655 five year old children (Beitchman et al 1986), children were rated for the presence of behavioural and emotional problems by their parents and teachers. A high prevalence of attention deficit disorders and emotional disturbance in speech and language impaired children was found compared to a matched control group. The rate of disorder among the

Table 1.5.1 Summary table of studies investigating into the psychiatric outcomes of speech and language impaired children

Study	Age at follow up	Participants	Assessment areas	Summary of findings
Baker & Cantwell (1987a)	Cross sectional	600 children from a community speech clinic	Interview with parent and child Conners (1973) and Rutter (Rutter, Graham and Yule 1970) parent and teacher behaviour rating scales	<ul style="list-style-type: none"> • 50% found to have diagnosable psychiatric disorders • Speech and language factors were identified as being most significantly associated with psychiatric illness compared to medical, neurological and biological factors.
Baker & Cantwell (1987b)	Initial assessment at mean age of 5 years and 7 months Follow up at mean age of 9 years and 1 month	300 children who initially presented at community speech clinics	Psychiatric evaluation	<ul style="list-style-type: none"> • Prevalence of psychiatric disorders increased from 44% to 60% at follow up
Baker & Cantwell (1982)	Cross sectional study	180 children with a Communication disorder. Subgrouped into those with a pure speech disorder and those with language disorders.	Psychiatric evaluation	<ul style="list-style-type: none"> • Prevalence of psychiatric disorder was highest in the group with language involvement and lowest in the pure speech disordered group. • Developmental disorders most common in the language disordered group and least common in the speech disordered group.
Beitchman, Brownlie, Inglis et al (1996)	Age at initial assessment = 5 years Age at follow up = 12.5 years	202 speech/language impaired and control children Control matched group	Psychiatric evaluation Speech and language assessment	<ul style="list-style-type: none"> • Psychiatric disorder at age 12.5 years was more likely to co-occur with language disorder than with speech disorder • Receptive and pervasive speech/language impairment in early childhood was associated with the greatest risk at follow up.

1.5.1 Continued

Beitchman, Nair, Clegg, Ferguson & Patel (1985)	5 years	Cross sectional community sample of 1655 children Control matched group		<ul style="list-style-type: none">Speech/language impaired boys differed from controls on conduct disturbance and girls did so on “anxious-passive” and “day dreams”
Cantwell & Baker (1987a)	Longitudinal	202 children with a referral of communication disorder	Psychiatric evaluation	<ul style="list-style-type: none">Poor psychiatric outcome could be predicted by the presence and severity of initial disorders of language comprehension and expression and by certain environmental factors
Cantwell & Baker (1987b)	Cross sectional study	600 children with communication disorders subgrouped into: Pure speech disorders Speech and language disorders Pure language disorders	Evaluated for psychiatric and developmental disorders	<ul style="list-style-type: none">The 2 subgroups with language involvement had higher rates of both psychiatric and developmental disorders than the children with pure speech involvement.Children with pure speech disorders were most likely to have emotional disorders and those with language involvement were most likely to have both behavioural and emotional disorders.
Cantwell & Baker (1981)	Cross sectional study	200 children with speech and language disorders	Speech Language IQ Psychiatric evaluation	<ul style="list-style-type: none">50% of the sample had some definable psychiatric disorderThe most common diagnoses were behaviour disorders, followed by emotional disorders
Cantwell, Baker, Rutter & Mawhood (1989)	Initial assessment: Autistic = 9:0 years DLD = 8: 02 years Follow up: Autistic = 10:02 DLD = 9:06	15 = Autistic 14 = DLD	Language Social functioning Behaviour	<ul style="list-style-type: none">Some of the DLD group had developed greater difficulties in peer relationships since the initial assessment even though their language functioning had improved.

Table 1.5.1

Fundudis (1979)		Newcastle Epidemiological study General population sample of children with Specific speech delay	Teacher questionnaire of behavioural deviance	<ul style="list-style-type: none"> • A trend towards behavioural deviance and introversion in the speech retarded children • The psychopathological disturbance was found to be greater when the speech delay was associated with motor delay
King, Jones & Lasky (1982)	13 to 21 years	N = 50 initial diagnosis of a communication problem subdivided into: verbal communication (n = 5) language disorder/delayed (n = 18) articulation problems (n = 18) language and articulation (n = 7) articulation and fluency (n = 2)	Telephone interview with parents	<ul style="list-style-type: none"> • Problems in social relationships only for the 4 participants initially diagnosed as language disorder/delayed speech
Paul & Cohen (1984)	Mean age of 14 years and 2 months	11 = DLD 7 = "atypical" DLD	Behaviour	<ul style="list-style-type: none"> • Hyperactivity was rated by 55% of the parents for all of the participants. • 78% in the mentally retarded range
Silva, Justin, McGee & Williams (1983)	Initial assessment at 3 years and follow ups at 5 and 7 years	Epidemiological study of New Zealand children	Language (prevalence and stability of language delay) Teacher questionnaire	<ul style="list-style-type: none"> • Increased teacher reported problems in delayed speech with normal IQ groups • Significantly more behavioural disorders in children identified as having a language delay
Stevenson, Richman & Graham (1985)	Initial assessment at 3 years Follow up at 8 years	Epidemiological study of 535 children	Language Behaviour	<ul style="list-style-type: none"> • The children from the sample with a low level of language ability had an increase in emotional/behavioural disturbance at 8 years of age

speech and language impaired children ranged from 22.1% (according to parent report) to 48.7% (according to psychiatric evaluation). This finding was replicated by the Baker & Cantwell 1987b in a sample of 600 children who were referred to community speech clinics. Again, over half of these children were found to have behavioural, emotional and developmental disorders.

A higher prevalence of psychosocial type problems has also been identified in studies that have focused more on the linguistic ability of speech and language impaired children. King et al (1982) found that of four adolescent participants initially diagnosed as language disordered, 1 had difficulty in relationships with his family, siblings and peers and had received professional help for this. Two of the participants experienced difficulty in peer relationships and one experienced problems in his relationships with his siblings. Three of these four participants still had residual speech and language problems. This retrospective follow up study lacked information regarding the initial psychiatric status of these participants and therefore it was not possible to trace the longitudinal course of their behaviour problems. In addition, information was obtained by telephone interviews rather than direct evaluation of the participants.

A higher prevalence of psychiatric disorders in children with speech and language impairments has been identified. This has been found in children assessed at one time point and in longitudinal studies. The children recruited to the studies discussed have consisted of children with developmental disorders, pervasive developmental disorders and mental retardation in addition to their speech and language impairments. This continuing problem of heterogeneity in the samples

studied complicates the findings in that the psychiatric disorders identified may be due to factors that are not considered to be specifically related to speech and language impairments.

1.5.2) RELATIONSHIPS BETWEEN SUBTYPES AND PSYCHIATRIC OUTCOME

Importantly, some studies have investigated the psychiatric outcomes of different subtypes of children labelled as communication disordered. Baker & Cantwell (1987a) studied 600 children with a diagnosis of communication disorders who were subdivided into children with pure speech disorders, pure language disorders and disorders of both speech and language. All the 600 children were assessed as having performance IQ scores above 80 and were between the ages of 6 and 9 years. The label pure speech disorder was given to those children with abnormal speech fluency, rate or articulation but with normal language comprehension, expression and use. Children with pure language disorders were defined as showing abnormal development in language comprehension, expression or usage. Children with both speech and language disorders were those with deficits in both speech and language.

Overall Baker & Cantwell (1987a) found that 50% of the 600 children had a diagnosable psychiatric disorder and were termed psychiatrically ill. The remaining 50% received no psychiatric diagnosis and were called the well group. Further analysis of the psychiatrically ill group showed that children in the pure speech disorder group were less likely than children in the other two groups to have any psychiatric disorder. However, children in the two groups with language involvement were equally likely to have a psychiatric disorder. More than 70% in each of the two

language groups had some DSM-III Axis I diagnosis. The pure speech disordered group was most likely to have an emotional type of psychiatric disorder, whereas behavioural disorder was more common in the pure language disordered group. Both behavioural and emotional disorders were found in the speech and language disordered group.

In an earlier phase of the study presented in this thesis, Cantwell, et al (1989) compared 14 of the developmentally language disordered (DLD) participants who are participating in this study to a group of autistic boys. All participants ranged in age from six and a half to eleven and a half years of age. All participants had normal performance IQs, no hearing impairments and no overt cause to explain their language impairments. The initial assessment had taken place 2 to 3 years earlier and therefore this was an interim follow up. As part of the assessment, a standardised investigator based interview was conducted with the parents which covered the following four major areas of functioning: language development, peer relations and social responsiveness, stereotyped or repetitive behaviours and disruptive public behaviours. The interviewer obtained examples of the children's behaviour in these four areas and made ratings on the basis of these descriptions. In general, more autistic children than DLD children showed poor functioning in all of the areas. No marked changes occurred in any of the four areas for the autistic group. The DLD group showed much more change, particularly in the area of social behaviour, which had deteriorated from the initial assessment at the age of 8 years.

Several studies have shown that emotional and social problems are common even in children with speech/language impairment whose IQs are in the normal range. In this

group the psychiatric risk tends to be greater when there is a deficit in language and not just an articulation or speech deficit. Again, a range of psychiatric disorders has been identified in these children.

1.5.3) LONGITUDINAL PSYCHIATRIC OUTCOMES OF SPEECH AND LANGUAGE IMPAIRED CHILDREN

Longitudinal studies investigating the psychiatric outcome of speech and language impaired children have found that psychopathological problems increase rather than diminish.

One of the most informative studies was conducted by Baker & Cantwell (1987b) who investigated the psychiatric status of three hundred children who initially presented at a community speech clinic. At the initial assessment, the sample had a mean age of 5 years and 7 months and their mean IQ was 107.5. 38% (n = 114) of the sample presented with pure speech disorders, 55% with speech and language disorders and 7% (n = 21) with pure language disorders, the criteria being the same as in Baker and Cantwell (1987a)

Initially, 44% of the sample was diagnosed as having a psychiatric disorder and 56% had no psychiatric illness according to DSM III criteria. At follow up the sample had a mean age of 9 years and 1 month and the overall prevalence of psychiatric disorders had increased from 44% at the initial assessment to 60% at follow up. Furthermore, almost a fourth of the sample was initially psychiatrically well but became psychiatrically ill at follow up. The majority of the 8% who were initially psychiatrically ill but had recovered at follow up had received an initial description of

a pure speech disorder. The significant increase in psychiatric disorder amongst the sample led Baker & Cantwell (1987a) to conclude that children with communication disorders are at risk for later psychiatric disorders.

Beitchman et al (1996) conducted a valuable longitudinal study of the psychiatric functioning of 202 speech and language impaired children and control children. Both groups were initially assessed at the age of 5 years and followed up at 12.5 years. It was found that psychiatric disorder at age 12.5 years was more likely to co-occur with language disorder than with speech disorder. Furthermore, receptive and pervasive speech/language impairment in early childhood was associated with the greatest risk at follow up.

The psychiatric status of the 19 DLD participants reported in this thesis when assessed at the mean age of 25 years was found to be extremely interesting. Two of the group had developed florid paranoid psychoses in late adolescence compared to no cases of psychosis from the autistic group. At the initial assessment, 35% (n = 7) of the DLD group showed poor peer relations which increased to 50% (n = 10) in middle childhood and in adult life 70% (n = 14) showed impaired social functioning.

Very little literature exists pertaining to the possible link between early speech and language impairment and the development of psychotic conditions in adult life. Some cases of schizophrenia are preceded by developmental problems but are not necessarily specific to speech and language (Rutter & Garmezy 1983). In addition, follow ups of children with autism have not found that they have developed schizophrenia in adult life (Rutter 1970, Lotter 1978, Mawhood 1995). However, a

few autistic children and adults with Aspergers syndrome have been found to develop psychotic episodes (Petty, Ornitz, Michelman et al 1984, Wing 1981). The two cases of florid paranoid psychosis in the follow up of the 19 DLD participants is very interesting as it seems to point to a more direct link between language and psychiatric disorder.

Although a higher prevalence of psychiatric disorders has been identified in children with speech and language impairments, it is the involvement of a language component and receptive abilities which are associated with a greater risk for poor psychiatric outcome. Unfortunately, methodological issues again confuse this relationship. The criteria for separating speech and language impairments in the large samples are subjective and not strictly based on standardised speech and language assessments. In addition, children with other developmental disorders where speech and language impairments are secondary have been included in the samples studied. This lack of studies controlling for low intelligence, developmental delays and profound socio – behavioural deficits undermines the theory that increased prevalence of psychiatric disorder is solely due to speech and language impairments.

1.5.4) MECHANISMS LINKING SPEECH AND LANGUAGE IMPAIRMENT AND PSYCHIATRIC DISORDER

Studies have found that there is a higher prevalence of psychiatric problems in children with current impairments of speech and language and adolescents with a history of speech and language impairments. The prevalence is higher in those children and adults where language is involved in the impairment. Over time, the psychiatric problems increase and have been found to be very severe in adult life.

There are considerable difficulties in interpreting the findings from these studies as they have varied greatly in their definitions of developmental speech/language disorder and in their measures of psychopathology. However, the overwhelming finding from the majority of investigations has been that children with developmental speech/language disorders have a raised rate of psychopathology.

Taking all the available data into account, the main types of psychopathology associated with DLDs appear to be anxiety-related symptoms, social difficulties and attention-deficit problems. Conduct disturbances and anti-social behaviours do not appear to be strongly related. The finding that there are increased rates of psychopathological problems in DLD children questions what exactly underlies the pattern of impairment. Simplistically, three levels of causality exist: (1) language disorder directly causes psychiatric disorder, (2) psychiatric disorder causes language disorder, e.g. schizophrenia, (3) the language disorder and the psychiatric disorder are both consequences of a more common underlying cause, e.g. a neurodevelopmental delay.

Howlin & Rutter (1987), Cantwell & Baker (1977) and Beitchman (1985) have attempted to explain the possible underlying mechanisms that may be involved in the psychopathological associations found in speech and language impaired children. The first postulated mechanism is that common antecedents may explain both the language delay and the associated psychopathology. Such antecedents include low IQ, temperamental difficulty, neurodevelopmental impairment and family disadvantage or psychosocial deprivation, e.g. temperamental difficulties may predispose a child to certain behavioural and educational problems because of factors

such as short attention span and hyperactivity. Cantwell & Baker (1977) theorised that the factors associated with large family size such as language delay, low verbal IQ and poor reading skills contribute to behaviour problems. Therefore, the factors associated with large family size may result in both language impairment and behavioural problems. This type of mechanism might account for some of the less severe language delays but seems unlikely to explain the more severe and specific developmental language disorders previously discussed.

The second mechanism refers to the ways in which speech and language impairments may lead directly to psychiatric disorders. Speech and/or language disability may predispose to social or emotional problems because of the child's difficulties in communication or because atypical speech and language behaviours increase the risk of social rejection from others. Therefore, the difficulties are secondary consequences of the speech and/or language impairment. If speech or language difficulties lead to problems in communication they are also likely to lead to serious problems in developing friendships. Even though major language abilities have been achieved, the more subtle aspects of communication may remain impaired, thus leading to rejection and hence emotional and behavioural problems. Scholastic problems create their own risks, e.g. a lack of academic progress and educational failure resulting in peer rejection, low self esteem and subsequent behaviour problems. A final example suggests that a failure to develop normal language skills may negatively affect parent-child interactions. Difficulties in communication between parent and child may result in abnormal interactions which again may result in rejection and subsequent emotional and behavioural problems.

Another antecedent that has been proposed is an underlying neurodevelopmental delay. Tallal, Dukette & Curtiss (1989) assessed 4 year old children using the Achenbach Child behaviour Checklist and found that descriptions such as “clumsy”, “confused” and “can’t concentrate” differentiated language-impaired children from controls. The fact that these behavioural abnormalities are associated with attention, perception and motor functions led to the suggestion that an underlying neurodevelopmental delay could account for both the language handicap and many of the associated behaviour problems in language impaired children.

Beitchman (1985) supports this mechanism by proposing that neurodevelopmental immaturity is a causative factor in speech and/or language impairment with speech and language impairment falling within the cumulative risk of psychiatric disorder. Beitchman (1985) argues that some speech and language impaired children may have a general neurodevelopmental immaturity. This would manifest itself in delays in visual-motor function, more general cognitive delays and a greater vulnerability to psychiatric and behavioural disturbance. This is further explained by Beitchman suggesting that there may be a gene or a group of genes that influence or control neurodevelopmental maturation. Some of the early and more obvious effects could appear in the form of delays in speech and language development. Parallel delays may appear in visual-motor function, emotional development and more general cognitive development. Speech and language impairment may be considered an additional risk factor which, when added to other risk factors, raises the risk of psychiatric disorder. If the model of neurodevelopmental immaturity proposed is correct, the risk of psychiatric disorder among the speech and language impaired will increase as a function of the underlying severity of the neurodevelopmental immaturity (as judged

by the number of parallel symptoms present, e.g. low IQ, and poor visual –motor coordination) and as a function of the addition of risk factors that are not directly a derivative of the neurodevelopmental immaturity such as environmental factors.

A final mechanism is that the speech and language impairment and the social impairments both constitute an intrinsic part of the language disorder, with both the speech and language impairment and the social impairment stemming from some underlying and unknown specific cognitive deficit.

There is as yet not enough data to explore these hypotheses fully. It is logical that no one hypothesis is likely to explain all the psychopathological associations. The lack of adequate data and methodological problems of the existing studies make testing the competing hypotheses difficult. However, it seems that the more severe the speech and language impairment, the greater the risk of associated psychiatric problems.

1.6.5) SUMMARY

There is a high prevalence of psychiatric disorders in children with speech and language impairments. The prevalence is higher in those children where language and receptive abilities are primarily involved. The psychiatric disorders identified include both emotional and behavioural disorders and other developmental disorders. Of the studies, which have followed up children from an initial assessment, psychiatric disorders have tended not to resolve and new cases of psychiatric disorders have increased both before adolescence and in early adult life. The exact mechanisms by which children with speech and language impairments including developmental language disorders develop psychiatric disorders are unknown. The

most reliable way to determine the link between developmental language disorders and psychiatric disorder is to prospectively follow up children with a confirmed diagnosis (and specified subtypes within this) well into adult life using valid comparison groups controlling for family background, intelligence and social class. This will enable further understanding of the possible direct link between developmental language disorders and psychiatric disorders.

SECTION 1.6: THE STUDY: AN HISTORICAL PERSPECTIVE

Historically, the initial aim of this study in 1968 was to test the hypothesis that a specific deficit in language development underlies the development of autism (Bartak et al 1975). In particular, if autism was solely a consequence of a specific deficit in language development or a result of other unidentified cognitive deficits. Bartak et al (1975) recruited two groups of children to test this hypothesis, one group with autism and one without autism but both with what was termed a severe developmental disorder of receptive language.

Bartak et al (1975) proposed that within the heterogeneous group of children with speech and language impairments there is a subgroup that shows a severe developmental deficit in language comprehension which subsequently affects expressive language. The exact causal nature of the language or cognitive deficit in these children is unknown as they have normal performance intelligence and no overt medical, neurological or functional cause for the disorder. Socially and behaviourally, children with this disorder were considered different to children with autism. However, a small proportion did show mild autistic type features in early childhood. In the 1960s, this subgroup was classified as having a severe developmental disorder of receptive language (DRLD) or what is now called a developmental language disorder (DLD).

In order to meet the criteria for the two groups of children, a search was made for boys between the ages of 4 years 6 months and 9 years 11 months with a performance IQ of at least 70. They had to present with a current disorder of language comprehension which had been present from infancy and was not due to overt

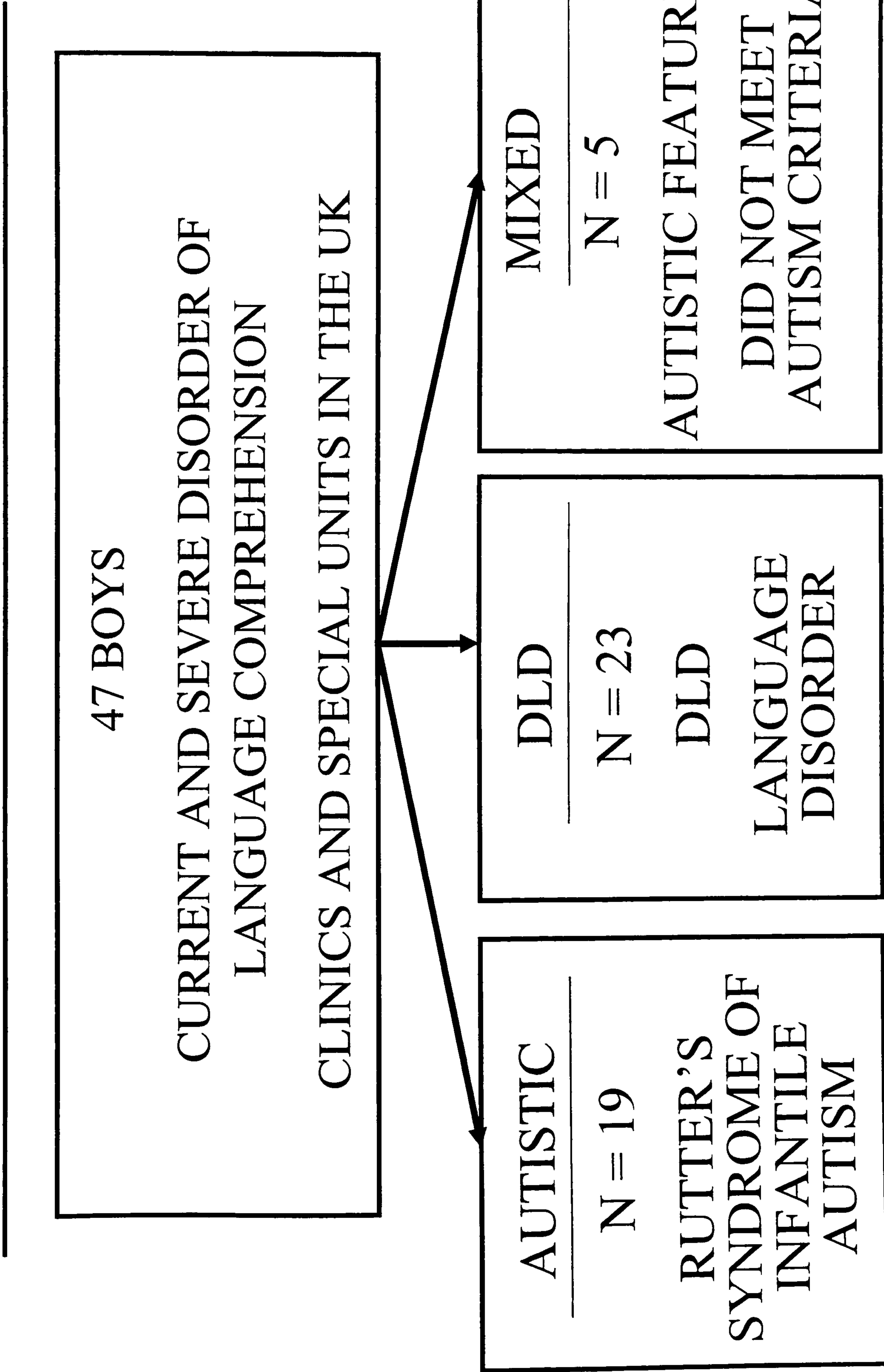
neurological disorder or peripheral deafness i.e. a bilateral hearing loss exceeding 40 dB. Girls were excluded as locating autistic girls who fulfilled these criteria was considered too difficult and rather than attempting to control for possible sex differences it seemed preferable to restrict recruitment to boys.

A wide range of clinical and educational facilities were approached in order to obtain a representative sample. Paediatric, neurological, audiological, speech and child psychiatric clinics were included, as well as special schools taking either children with autism or uncomplicated language disorders. These major units within the UK were asked for details of cases that might meet the above criteria. On the basis of data available from case notes, parents of suitable cases were contacted for permission to include them in the study and the eventual sample was made up of children attending 4 hospital units and 6 special schools.

Within the 47 boys selected with a severe developmental receptive language disorder, a subdivision was made using the available clinical and school records. Figure 1.6a shows the subdivision of the group. Accordingly, 19 children were classified as showing the syndrome of infantile autism using the criteria outlined by Rutter (1971), and were termed the autism group. In order to be classified as autistic there had to be a profound and general failure to develop social relationships; one or more ritualistic or compulsive phenomena (in addition to language delay), and an onset occurring by the age of 30 months. Aloofness, apparent lack of interest in other people, avoidance of eye to eye gaze and little variation in facial expression were the identifiable features which confirmed failure on social development. The ritualistic and

Figure 1.6a

INITIAL RECRUITMENT IN 1968

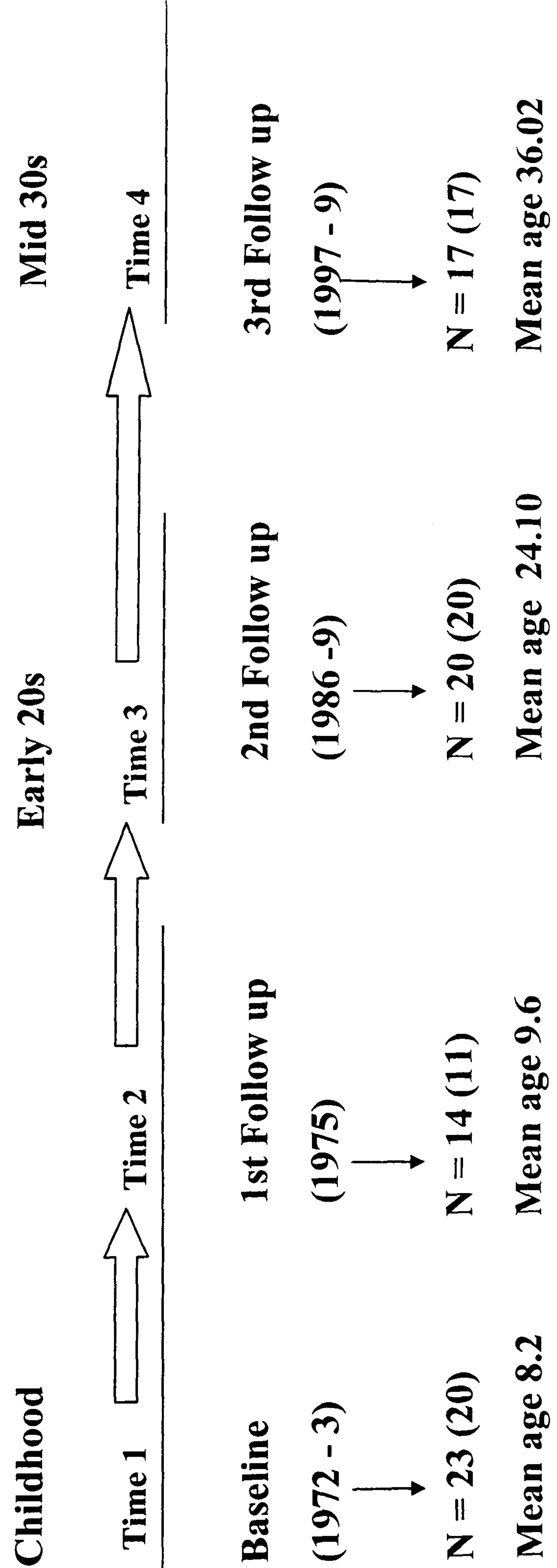


compulsive phenomena included morbid attachment to unusual objects, resistance to changes of any kind, peculiar preoccupations and a variety of quasi-obsessive rituals.

There were 23 children clearly without autistic features, and these were diagnosed as having an uncomplicated developmental language disorder that included impairment in both language comprehension and expression. These were referred to as the dysphasic group and are now the specific focus of the current study. In addition there were 5 children who showed some autistic features but whose disorder was regarded as partial or atypical in its manifestations. These boys were referred to as the mixed group.

The initial stage of the study in 1968 (Bartak et al 1975) focused on the autistic boys with the DLD boys acting as a comparison group to control for the language deficit. The autistic boys and the DLD boys were subsequently followed up into middle childhood (Cantwell et al 1989) and their early twenties (Howlin et al 2000, Mawhood et al 2000, Mawhood 1995). Figure 1.6b shows the longitudinal progression of the study. Due to the unexpected problems the DLD group was found to be experiencing in middle childhood and twenties, it was decided that this present study would focus solely on the functioning of the DLD group in their mid thirties. Their outcome is compared to three comparison groups. The first comparison group was their non language disordered siblings. The second comparison group was matched to the DLD group on age, gender and performance intelligence. The third comparison group was a general population cohort matched to the DLD group on childhood performance IQ and social class.

**Figure 1.6b 28 YEAR FOLLOW UP OF MALES WITH
DEVELOPMENAL LANGUAGE DISORDER (DLD)**



() participants involved in the longitudinal description

1.6.1) TERMINOLOGY

Data pertaining to the development of the DLD group is available at four time points: the first initial assessment in early childhood is referred to as Time 1, the first follow up into middle childhood as Time 2, the second follow up into their 20s as Time 3 and this current follow up into their 30s as Time 4.

The developmental language disordered group had been referred to as dysphasic in the first assessment and first follow up in middle childhood. It was decided at Time 3 to rename them the Developmental Language Disordered cohort (DLD). The use of this term is continued for the current study.

1.6.2) EXCLUSIONS

At Time 3 (early twenties), when the DLD cohort had reached their twenties, all 23 of the DLD participants were given a screening hearing test using a free-field warble tone audiometer (Meg Instrumentation Ltd). It was found that 3 members of the DLD cohort had a significant hearing loss. Although the original study had specifically stated that children with a bilateral hearing loss exceeding 40dB were to be excluded, the fact that these adults were clearly not presenting as deaf as children show the difficulty in making a differential diagnosis. These 3 members were excluded as their hearing impairments may have resulted in them constituting a different diagnostic group. With the exclusion of these participants the DLD cohort was reduced from 23 to 20. At time 3 (early twenties), 19 members of the DLD cohort completed the cognitive assessments and information regarding their social functioning was available for 20 members of the cohort.

1.7) DESCRIPTION OF ASSESSMENTS COMPLETED

The DLD cohort has previously been assessed three times. At the three time points, the cohort has been assessed on both their cognitive abilities and their social functioning. A summary of the major findings from each of the time points will be presented. As a result of the exclusions at time 3 (early twenties) and in order to be coherent, the summary consists of the analysis of 20 of the DLD participants at Time 1, 11 at Time 2 and 19 at Time 3. A summary of the outcome of the DLD group in childhood, middle childhood and early twenties is presented and discussed. Table 1.7 details the assessments used at time 1, time 2 and time 3.

1.7.1) Time 1: The Initial Assessment (aged 8 years and 2 months) (Bartak, Rutter & Cox 1975)

Cognitive assessment

The DLD cohort at the initial assessment consisted of 23 boys, but 3 who were found to be hearing impaired in their 20s at time 3 (early twenties) were excluded. At the mean age of 8 years and 2 months, the DLD cohort had a mean verbal intelligence (IQ) score of 78.0 (S.D 8.7), a higher mean performance IQ of 89.2 (8.9) and a *Peabody Picture Vocabulary Test (PPVT)* (Dunn 1959) intelligence score of 76.5 (S.D 9.1). Their mean comprehension age equivalent score as measured by the *Reynell Developmental Scales* (Reynell 1969) was 5 years and 2 months and their mean expressive age 4 years and 10 months. The *Graded Word Reading Test* (Schonell & Schonell 1960) provided a measure of word recognition and the *Silent Reading Test* (Schonell & Schonell 1960) ability to understand verbal material which had been read. Of the DLD cohort, 18 of the 20

Table 1.7 Cognitive assessments used at each time point over the longitudinal comparison

	Time 1 Initial assessment in childhood N = 20	Time 2 Middle childhood N = 11	Time 3 Twenties N = 19
Mean ages	9 years 11 months	13 years 4 months	24 years 3 months
Assessment area			
Verbal IQ	<ul style="list-style-type: none">• Wechsler Intelligence Scale for Children (WISC) (Wechsler 1949)• Peabody Picture Vocabulary Test (PPVT) (Dunn 1959)	<ul style="list-style-type: none">• Peabody Picture Vocabulary Test (PPVT)(Dunn 1959)	<ul style="list-style-type: none">• Verbal scale of the Wechsler Adult Intelligence Scales (WAIS-R) (Wechsler 1981)
Performance IQ	<ul style="list-style-type: none">• WISC (Wechsler 1949)	<ul style="list-style-type: none">• WISC (Wechsler 1949)	<ul style="list-style-type: none">• WAIS-R (Wechsler 1981)
Receptive language	<ul style="list-style-type: none">• Comprehension scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Comprehension scale of the Reynell Developmental Language Scales (1969)	<ul style="list-style-type: none">• British Picture Vocabulary Scales (Dunn et al 1982)• Oral comprehension test (adapted from Neale 1958)
Expressive language	<ul style="list-style-type: none">• Expressive scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Expressive scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Expressive One Word Picture Vocabulary Test (EOPVT) (Gardner 1979)
Literacy	<ul style="list-style-type: none">• Graded word reading test R1 (Schonell & Schonell 1960)• Silent reading test A (Schonell & Schonell 1960)	<ul style="list-style-type: none">• Not assessed	<ul style="list-style-type: none">• Gray oral reading test form A (Gray 1967)• Schonell graded word spelling test A (Schonell & Schonell 1960)• Edinburgh reading tests (shortened version) (McBride & McNaught 1985; Pollit 1977)

participants were able to complete the *Graded Word Reading Test* (Schonell & Schonell 1960) compared to only 7 participants for the *Silent Reading test* (Schonell & Schonell 1960). The mean reading quotient of the DLD cohort on the *Graded Word Reading Test* was 73.9 (9.4) and 86.4 for the *Silent Reading Test*.

Social and psychiatric assessment

Table 1.7.1 shows the much superior level of social functioning of the DLD cohort in comparison to the autistic group. The DLD cohort had a mean *Vineland Social quotient* (Doll 1947) of 91.3. They were therefore regarded as being as socially mature as they were intellectually. Autistic aspects of social behaviour were observed and rated in the children following a period of play with the tester. It was found that the DLD boys were far less behaviourally disturbed and were more socially mature and responsive than the autistic boys. Significant differences were found between the autistic group and the DLD group with the autistic group showing profound deficits in behaviours such as engaging in eye to eye gaze, variation in facial expression, imaginative play, more temper tantrums and more hand and finger stereotypies, more quasi-obsessional and ritualistic behaviours and difficulty in adapting to new situations. The groups did not differ on the behaviours of attachment to odd objects or resistance to change in the home environment. However, fewer of the DLD group than the autistic boys showed these behaviours. Overall, the DLD group were found to have severe deficits in language, with normal performance IQs and some social and behavioural problems which were not pervasive enough to be classified as autistic behaviours (Bartak et al 1975).

The table shows that the initial diagnoses of autism and developmental language

disorder as made from case notes and parental report were valid in that they were associated with quite marked social and behavioural differences between the groups.

Examination of the cognitive profiles of the DLD cohort shows that their IQ scores were well within the normal range with a higher performance IQ than verbal IQ. A mean verbal – performance IQ contrast score was calculated at 11.2 IQ points (S.D 8.5). Both receptive and expressive language was well below the DLD cohort’s chronological ages. The results from the literacy assessments were also poor especially since only 7 DLD boys could complete the reading comprehension assessment.

Table 1.7.1 Social characteristics and behaviours of the DLD group in comparison to the autism group (Mawhood 1995)

Social behaviour: Number of participants presenting with the following behaviours	Autism (n = 19)	DLD (n = 20)
Gaze aversion (ever)	17	1
Has own friends	3	18
Group play	-	17
Disturbance while shopping	14	1
Disturbance when friends visit	11	-
Disturbance in restaurants	14	2
Difficulty adapting to new situations	14	1
Quasi-obsessional activities	16	4
Ritualistic activities	13	2
Resistance to change	8	3
Attachment to odd objects	10	4

1.7.2) Time 2: Middle childhood (aged 9 years and 6 months) (Cantwell, Baker, Rutter & Mawhood 1989)

Cognitive assessment

The first follow up of the DLD cohort took place between two and three years after the initial assessment and diagnosis. Due to various problems including recruitment difficulties, this follow up consisted of a much reduced data set. 14 DLD boys were recruited and described by Cantwell et al (1989). 3 of these participants were found to be hearing impaired at time 3 and therefore are excluded from the analysis leaving a total group of 11 participants. The mean age of the DLD cohort was 9 years and 6 months (range, 6 years and 6 months to 11 years and 6 months). Verbal IQ and literacy were not assessed.

The mean performance IQ was 92.4 with 1 participant scoring below 70 IQ points at 69. Two to three years after the cohort were first assessed, performance IQ had remained stable and well within the normal range, with no deterioration in performance IQ as measured by the *Wechsler Intelligence Scale for Children (WISC)*.

The Reynell Developmental Scales (Reynell 1969) were used to assess receptive and expressive language. From the initial assessment to this first follow up, language skills had improved. Only one member of the DLD cohort failed to score above the ceiling level of 6 years on the comprehension scale. On the expressive scale all 11 DLD boys reached the ceiling level.

Social and psychiatric assessment

The picture with social behaviour was more complex. 2 members of the DLD group

had improved in their social relations but 2 had become substantially worse. One of these had shown poor language both at the initial assessment and at this follow up. However, the other had shown a deterioration in social behaviour despite having improved in language functioning. In the category of disruptive public behaviours, none of the DLD boys showed overall improvement and 1 DLD boy showed a worsening within this category. It was not at all clear why social relationships should have deteriorated in the DLD group given that their language was improving.

1.7.3) Time 3: Early adult life (aged 24 years and 10 months) (Mawhood, Howlin & Rutter 2000: Howlin, Mawhood & Rutter 2000)

At this follow up, the DLD cohort had reached a mean age of 24 years and 10 months (S.D 1.56). 19 members of the DLD cohort were recruited and assessed on cognitive measures but information regarding social functioning was available for 20 members of the DLD cohort. 3 members of the initial 23 participants of the DLD cohort were excluded at this time point as they were found to be hearing impaired.

Cognitive assessment

A change occurred in performance intelligence (IQ), where there was a drop of 14 IQ points from 92.4 in middlechildhood to 78.4 at this follow up. There was also a slight drop in the mean verbal IQ score from 78.14 (8.08) to 75.3 (7.92). The drop in performance IQ changed the IQ pattern that was found in the initial assessment where a discrepancy between verbal and performance IQ was identified. The mean *PPVT* (Dunn 1959) IQ score of the DLD cohort also dropped to 63.2 (18.86).

The mean *BPVS* (Dunn et al 1982) raw score was 99.58 (S.D 19.74) which

corresponded to a median age equivalent score of 10 years and 4 months. The mean *EOPVT* (Gardner 1979) raw score was 20.35 (S.D. 11.87) with a median age equivalent score of 11 years and 6 months.

Literacy was assessed at this time point. *The Gray Oral Reading Test* (Gray 1967) was used to measure reading accuracy, 3 members of the DLD cohort reached the ceiling age equivalent score of 17 years and the median age equivalent was calculated at 10 years. For the *Edinburgh Reading Test* (McBride & McNaught 1985) which measured overall reading ability, 1 DLD participant was at the ceiling level of 16 years and 1 participant did not reach the basal age equivalent of 7 years. The overall median age equivalent for the remaining 17 subjects was 10 years and 3 months. On the spelling assessment, the median age equivalent was 9 years and 11 months. None of the cohort reached ceiling level.

Social and psychiatric assessment

The social, emotional and occupational functioning assessment of the DLD group proved to be interesting with many of the group having difficulties within the areas of independent living, academic achievement, employment and relationships. For example: 11 participants were still living in the parental home, none of the participants had passed any public examinations, 13 had not been in continuous paid employment, 9 had never been in a close heterosexual relationship and 7 were felt to have friends with which they only shared rather stereotyped interests.

In addition, two members of the DLD group had developed major psychosis since middle childhood. One had suffered a schizophreniform illness with hallucinations

and delusions which had started at the age of 19 years. The other had also developed a schizophreniform disorder with delusions at the age of 20 years.

In early adult life, both verbal and performance intelligence had fallen from the assessment in middle childhood. Literacy and language abilities remained poor with low age equivalents. At the time of assessment, the DLD group were presenting with difficulties in their social functioning. In addition, 2 members of the group had developed schizophrenia in late adolescence and early adult life. Overall, the adult outcome of the DLD group was considered to be poor and therefore warranted further investigation.

1.8) IMPLICATIONS FOR THE TIME 4 FOLLOW UP: MID THIRTIES ASSESSMENT

The poor cognitive, social and psychiatric outcome of the DLD adults in their early twenties was very unexpected. Initially, the DLD group was recruited as the language control group to the autistic group. The DLD group fulfilled this role at all three of the assessment points. It was initially hypothesised at time 1 (childhood) that the language deficits of the DLD group would resolve over time. The emergence over time of difficulties in social functioning and the cases of psychoses in addition to unresolved language deficits were very interesting but also surprising.

The historical focus of this longitudinal study has always centred on the autistic group. Therefore, unavoidable and at the time, unknown methodological implications made it difficult at time 3 (early twenties) to specifically quantify the extent of the poor DLD adult outcome and to identify causal and explanatory mechanisms. A

further assessment of the DLD adults in their mid thirties offered a unique opportunity to explore this.

Further cognitive assessment was essential to continue the longitudinal cognitive analysis. Memory and theory of mind or social cognition are two recent areas of cognition which have become important in the study of developmental language disorders. The role of verbal short term memory, particularly phonological processing in early vocabulary acquisition has been identified (Gathercole & Baddeley 1995). For this reason, assessments of visual and verbal memory and phonological processing were necessary to determine whether the unresolved language deficits could be attributable to causal or associated memory deficits.

The poor social functioning of the DLD adults was particularly unexpected as initially the DLD group had not presented with significant abnormal social behaviours in childhood. It is only over time that difficulties in social functioning or adaptation developed. Theory of mind or social cognition is an aspect of cognition that has primarily been researched in the autistic population and is considered to be directly related to the abnormal social behaviours found in autism. Assessing social cognition in the DLD adults would help to determine whether the DLD adults had impairments in social cognition and the nature of these impairments, especially in relation to their language disorder. Furthermore, the Time 3 assessment took place in the early twenties of the DLD adults, a time which could be considered a transitional phase with respect to social adaptation. An assessment in their mid thirties would help to clarify whether social functioning impairments were transient or the start of more permanent and pervasive impairments.

The two cases of psychoses in the DLD adults in their early adult life raised questions about whether the DLD group was more susceptible to psychiatric disorder. Self report scales aimed at screening for psychiatric disorder, particularly schizophrenia were needed to establish this susceptibility. In addition, a further psychiatric assessment was needed to confirm whether the initial reported risk of psychiatric disorder was sustained during early adult life.

An assessment of economic cost within education, health, independence and employment was also considered important. The poor social and psychiatric outcome of the DLD adults in their twenties had anecdotally resulted in increased costs due to unemployment, access to the National Health Service and continued family dependence. An accurate analysis of economic costs would provide an approximate summary of the types and cost of services received by this diagnostic group.

No comparison groups were used at the assessment of the DLD adults in their twenties. As a result, it was not possible to prove whether the cognitive deficits, particularly the language deficits and the poor social functioning and psychiatric outcome were independent of intelligence level or family background. It was therefore essential to control for intelligence and family background in order to determine the specificity of the initial language disorder and its impact over time.

This indepth longitudinal study has provided an enormous amount of valuable data regarding the progression and outcome of a cohort of boys with developmental language disorders. Historically, the DLD cohort was recruited as a control group to

an autistic cohort to control for language impairment. Over time, the developing profile of the social, communication and psychiatric difficulties of the DLD cohort was both intriguing and unexpected. It was therefore decided that they deserved further follow up in their own right using the appropriate comparison groups to determine the true eventual outcome of developmental language disorders.

1.9) TIME 4: THE PRESENT STUDY (mid thirties)

HYPOTHESES

Hypotheses

The aim of the present study was to provide a fourth assessment of this cohort of DLD males in their mid thirties. Assessment includes a measure of current cognitive, social and psychiatric functioning.

There were a number of specific hypotheses:

- (1) *The receptive and expressive language deficits found in the DLD group during childhood will persist into adult life. Therefore, the DLD group will continue to exhibit expressive and receptive language deficits in adult life which are independent of performance intelligence and family background.*

The relatively few follow up studies of children with developmental language disorders have identified persisting receptive and expressive deficits which have not resolved over time (Stothard et al 1998, King et al 1982, Tomblin et al 1992).

(2) The DLD group will have poor literacy abilities in adult life, which are independent of performance intelligence and family background.

Children with developmental language disorders who have been followed up into adolescence and early adult life have been shown to be at risk for poor literacy and academic outcomes (Stothard et al 1998, Aram & Nation 1980, Hall & Tomblin 1978).

(3) The DLD group will show impaired ability in cognitive areas other than language, which are independent of performance intelligence and family background, specifically phonological processing and theory of mind.

Children with developmental language disorders have been found to show particular difficulties in phonological processing as measured by nonword repetition in comparison to language and age matched peers (Gathercole & Baddeley 1990). Stothard et al (1998) found that a group of adolescents with persistent specific language impairment and a group of adolescents with resolved specific language impairment were both significantly poorer than controls on nonword repetition. Therefore, adults with an initial diagnosis of developmental language disorders may also have phonological processing difficulties which have persisted into adult life. Such a deficit may have negative consequences on receptive vocabulary development (Gathercole & Baddeley 1990). The poor social functioning of the DLD adults at time 3 (early twenties) was unexpected as they had not previously presented with significant abnormal social behaviours. To determine the processes underlying poor

social function, measures of social cognition were included in the present study to identify a possible link.

(4) The social functioning of the DLD group will continue to be impaired.

When the DLD group were last assessed they were found to have poor levels of social functioning (Mawhood 1995). It is expected that these poor levels will persist further into adult life and have become more apparent.

(5) The impaired social functioning of the DLD group is related to their language and cognitive deficits and not their family background or level of childhood performance intelligence.

It is hypothesised that the poor social functioning of the DLD group is specific to their initial diagnosis of developmental language disorder. Their outcome will be compared to their non language disordered siblings to control for family background and a general population cohort matched on childhood performance IQ and social class taken from the National Child Development Study (NCDS) (Davie et al 1972, Wedge 1968, Fogelman 1983).

(6) The DLD group will continue to be at an increased risk of psychiatric disorder.

There is a high prevalence of psychiatric disorders in children with speech and language impairments. The prevalence is higher in those children where language and receptive abilities are primarily involved. Psychiatric disorders have tended not to

resolve and new cases of psychiatric disorders have increased both before adolescence and in early adult life.

The two cases of psychoses identified at time 3 raises the risk of the DLD group developing further psychoses as they reach their mid thirties.

(7) There will be higher economic costs associated with the DLD group.

At time 3 (early twenties), the DLD cohort were experiencing difficulties in their social adaptation and two cases of psychoses were also identified. Anecdotally, this poor social adaptation had resulted in increased costs within employment, independence, education and health. The poor social adaptation of the DLD cohort is hypothesised to continue and therefore higher economic costs are expected to be associated with this group.

CHAPTER TWO: METHOD

2.1 PARTICIPANTS

The developmental language disorder (DLD) cohort

Table 2.1 summarises the main characteristics of the DLD cohort and the three comparison groups. Strenuous efforts were made to contact all 20 of the DLD participants who were assessed at time 3 (early twenties). Some of this population were still living at the addresses where they had been seen at time 3 or had parents who were still living there. The National Health Service Central Register provided details of the participants' Family Health Services Authority (FSHAs). FSHAs were then contacted to identify the participants' GPs. GPs were then approached to provide up to date addresses or to send contact letters on to the participants. A few participants proved more difficult to trace and in these cases it was necessary to follow whatever leads were available. Eventually, it was possible to trace and make contact with all 20 of the DLD group. One of these 20 had declined to take part at time 3 (early twenties) in the cognitive assessment and did so again. A further two members of the group refused to take part this time reducing the final sample to 17 DLD participants.

Contact letters were sent out to inform previous participants including parents of this new phase of the study. The letter explained that the study would like to see them again and invited them to take part in this fourth follow up. When consent to participate was received, an appointment was arranged to see the participant and his parent (s) either together or separately depending on their living arrangements at their own home and at their convenience. The DLD participants received a small payment to reimburse them for their time and expenses.

Table 2.1 The DLD cohort and comparison groups

PARTICIPANTS	N	MEAN AGE AT ASSESSMENT	CHARACTERISTICS
DLD COHORT	17 males	36 years 2 months (S.D. 1.25)	<ul style="list-style-type: none">Initial diagnosis of DLD at mean age of 8 years and 2 monthsPerformance intelligence of >70 at 8 years and 2 monthsAbsence of medical or neurological disorder and hearing loss
SIBLINGS	16 (10 males, 6 females)	36 years 10 months (S.D. 6.04)	<ul style="list-style-type: none">Comparison group matched for family backgroundNon language disorderedNo history of medical or neurological disorders
IQ MATCH GROUP	17 males	36 years 8 months (S.D. 2.2)	<ul style="list-style-type: none">Comparison groupNon language disorderedNo history of medical or neurological disordersMatched to the DLD group on age, gender and performance IQ
NATIONAL CHILD DEVELOPMENT STUDY COHORT (NCDS)	1155 males	Initial information taken at 11 years and outcome information taken at 33 years	<ul style="list-style-type: none">General population comparison groupMatched to DLD cohort on childhood performance IQ and social classControlling for childhood performance IQ and social class on social adaptation analysis only

The comparison groups

Three comparison groups were included to assess the outcome of the DLD group. All three comparison groups served distinct and complementary functions in helping to isolate the specific effect of developmental language disorders on the outcome of the DLD group. The siblings provided a control for the possible effects of family background on cognitive, social adaptation and psychiatric functioning outcome. The IQ match group controlled for age and performance IQ on cognitive outcome only. The National Child Development Study cohort controlled for childhood performance IQ and social class on social functioning outcome only.

The sibling group (comparison 1)

The siblings were used as a comparison group to the DLD group on cognitive outcome, social functioning outcome and psychiatric functioning outcome in adult life. The sibling group (comparison 1) comprised the non language disordered siblings of the DLD group. They were recruited to identify whether the difficulties of the DLD group are attributable to their initial diagnosis of developmental language disorder or to their family background. The use of a non language disordered sibling group enables close comparison for the effects of family environment on adult social, educational and occupational functioning. Once contact was made with the DLD participant and his family, permission was obtained to contact a sibling. Male siblings closest in age to the DLD participant were the first choice. Where this was not possible, female siblings closest in age were selected. An appointment was then arranged to visit and assess the sibling in his or her own home. Unfortunately, male siblings were not available for six of the DLD participants so female siblings were therefore included. One DLD participant had neither a male nor a female sibling and therefore the sibling group consisted of 16 participants, 10 male siblings and 6 female siblings. The siblings received a small payment to cover time and expenses.

The IQ match group (comparison 2)

This group was used as a comparison group to the DLD group on cognitive outcome in adult life only. The IQ match group (comparison 2) consisted of volunteers matched to the DLD group on gender, age and performance intelligence. Volunteers were recruited from the Nottingham area by advertising in local facilities, e.g. community centres, employment centres and shops. This group was matched on performance IQ only because verbal IQ was lower than performance IQ in the DLD group. Therefore, it was not possible to match a single comparison group on both measures. In addition, verbal IQ is partly determined by language ability. Matching on verbal IQ would have increased the risk of the comparison group also having a language disorder. Therefore, performance IQ was considered a more reliable measure of intelligence. It was not possible to match this second comparison group on educational outcome due to the very poor educational outcome of the DLD group identified at time 3 (early twenties). Matching on geographical location was also difficult due to the wide and varied locations of the DLD group.

Initially, a short form of the WAIS-R (Wechsler 1981) was administered to the volunteer to determine their performance IQ score. If this matched the range of performance IQ scores for the DLD group they then went on to complete the entire cognitive assessment battery. The IQ match group consisted of 17 males matched to the DLD group on age and performance intelligence. These participants received a payment for their time and were assessed in the Developmental Psychiatry section at Queens Medical Centre, Nottingham.

A Cohort from the National Child Development Study (NCDS) (comparison 3)

A cohort from the National Child Development Study (NCDS) was used as a comparison group for adult social functioning outcome only.

NCDS is a prospective study of all children in Britain born in one week (3 –9 March) in 1958, a

total of 17000 in all. After the initial birth survey, childhood follow ups took place at ages 7 (Davie et al, 1972), 11 (Wedge, 1969) and 16 years (Fogelman, 1983) and included a range of assessments: medical examinations and educational testing, interviews with parents, and data collection from teachers and schools. The adult contacts at ages 23 and 33, involved interviews and questionnaires completed by the cohort members themselves (Ferri 1993).

It was necessary to find a subsample of boys from the NCDS cohort at the age 11 year sweep who matched the DLD group on performance IQ at their initial assessment when they had a mean age of 8 years and 2 months. This NCDS subsample was to act as a normal population comparison group matched to the DLD cohort on childhood performance IQ and social class with normal development in all other areas of ability. The adult outcome of this NCDS control group at age 33 years was compared with the adult outcome of the DLD group at age 36 years and 2 months.

A subsample of boys from the NCDS cohort with complete data in a previous study of mild mental retardation (Maughan, Collishaw and Pickles 1999) was examined (Maughan & Collishaw 1999). Boys scoring within a $-1.87sd$ to $+0.4sd$ range on a general ability test administered at age 11 years were included. This matched the performance IQ range of the DLD group at the age of 8 years and 2 months. The general ability test is a standardised 80 item group – based general ability test which was administered to cohort members at age 11 years. The test was designed by the National Foundation for Educational Research and included alternate verbal and non – verbal items and showed high reliability.

Boys with any sensory/medical/neurological problems at age 11 were excluded, as were boys who had ever attended special school and boys with any signs of speech and language problems (as assessed by parents and teachers). A modified Rutter A-scale (for parents) assessed behaviour problems at age 11 years. This scale included all the standard items, except for items 1 (restless),

16 (fussy), 17 (lies), 18 (bullies others). The top 16.3 % of scorers were also excluded (those scoring 10 or more). 1155 met the inclusion criteria for this study.

28.9% of these boys came from a professional/clerical social background. The others came from a manual background. Data were weighted to match a 43/57 balance between these two social groups. This matched exactly the proportions of the DLD adults (28.9%) who originated from a professional/clerical social background and the 69.1% who came from a manual background.

The adult social functioning outcome of this NCDS group of 1155 boys at age 33 years was compared to the adult social functioning outcome of the DLD group at the age of 36 years and 2 months.

2.2 MEASURES

A range of cognitive measures were used to assess verbal and performance intelligence, literacy, receptive and expressive language, higher language processes, theory of mind, visual and verbal memory, verbal short term memory and phonological processing. The choice of tests was determined by several factors. *Firstly*, the three previous studies had provided a large amount of data on verbal and performance intelligence, receptive and expressive language and literacy. Comparable tests were chosen here so that changes over time could be examined.

Secondly, because the participants were well into adult life, appropriate assessments needed to be found for this adult age group. Unfortunately, standardised language and literacy assessments which extend into the adult age range are extremely limited. Therefore, standardised language and literacy assessments with ceiling levels of approximately 16 to 18 years had to be used. Since the ages of all the participants were well above this ceiling, only the raw scores and age equivalent

scores could be calculated. Other cognitive measures were chosen to be appropriate for adults including second order theory of mind tasks, an adult test of phonological processing and an adult test of visual and verbal memory.

Table 2.2 Assessments

ASSESSMENT DOMAIN	SPECIFIC DOMAIN	ASSESSMENTS USED AT TIME 4 (MID THIRTIES)
COGNITIVE PROFILE	Intelligence	<ul style="list-style-type: none">• Short form of the WAIS-R (Wechsler 1992)
	Literacy	<ul style="list-style-type: none">• Wechsler Objective Reading Dimensions (Wechsler 1993)
	Expressive Language	<ul style="list-style-type: none">• Expressive One-word Picture Vocabulary test (EPVT) (Gardner 1979)
	Receptive Language	<ul style="list-style-type: none">• British Picture Vocabulary Scales (BPVS) (Dunn et al 1982)
	Syntactic and semantic understanding	<ul style="list-style-type: none">• Oral Comprehension Test (Mawhood 1995) based on the Neale Reading Test (1958)
	Social cognition	<ul style="list-style-type: none">• The Eyes Task (Baron-Cohen et al 1997)• Strange stories (Happé 1994)• Awkward Moments computer task (Phillips and Newman 1994)
	Visual and verbal memory	<ul style="list-style-type: none">• Doors & People (Baddeley, Emslie and Nimmo-Smith 1994)
	Working memory	<ul style="list-style-type: none">• Sentence repetition form A from the Multi-lingual aphasia examination (Benton & deS Hamsher 1989)
	Phonological processing	<ul style="list-style-type: none">• Adult test of nonword repetition (Gathercole & Baddeley 1997)
	Social/Emotional and Occupational functioning	<ul style="list-style-type: none">• Social/Emotional and Occupational functioning Interview–subject and informant based SEF-S & I)
PSYCHIATRIC FUNCTIONING	Adult psychopathology	<ul style="list-style-type: none">• Malaise Inventory (Rutter, Tizzard & Whitmore 1970)• Schizotypal Personality Questionnaire (SPQ) (Raine 1991)• Australian Psychosis Screen modified on the Psychosis Screening Questionnaire (Bebbington & Nayani 1995)• Schedule for schizophrenia and affective disorders – lifetime version (SADS-L) (Endicott & Spitzer 1978)
ECONOMIC ANALYSIS	Economic assessment	<ul style="list-style-type: none">• Client Service Receipt Inventory (CSRI) (Beecham & Knapp 1992)

Thirdly, some areas of functioning that were not investigated before and had become more relevant to the study of developmental language disorders, were of interest here. This resulted in some further new tests being incorporated into the assessment battery including tests of memory and theory of mind. Table 2.2 summarises the assessments used in the present study.

- **2.2.1) Intelligence Measures**

A short form of the *Wechsler Adult Intelligence Scale - Revised (WAIS-R)* (Wechsler 1992) was used to measure verbal and performance intelligence. The short form consisted of the three verbal subtests: comprehension, vocabulary and arithmetic and the two performance subtests, block design and object assembly. At the previous assessment when the DLD participants were in their mid twenties (time 3) the long form of the WAIS-R was used. It was necessary to devise a short form which would give the most accurate IQ scores for the DLD group so that the intelligence (IQ) scores from this fourth follow up could be compared with those from the third follow up. In addition the length of the short form had to fit within the time limits of the assessment. The statistical procedure for choosing the most accurate short form involved the pro rating the WAIS –R data from time 3 using various combinations of short forms, correlating these short forms with the long form and finally regression analysis of the short forms to the long form. This is described in appendix 1.

- **2.2.2) Literacy measures**

The three previous studies investigated reading and spelling ability using various measures including the *Schonell Graded Word Recognition Tests* (Schonell & Schonell 1960), the *Schonell Graded Word Spelling Test A* (Schonell & Schonell

1960) the *Gray Oral reading Test Form A* (Gray 1967) and a shortened version of the *Edinburgh Reading Test* (Pollitt 1997).

For the current study, the *Wechsler Objective Reading Dimensions* (WORD) (Wechsler 1993) was chosen. It consists of 3 sections measuring basic reading, reading comprehension and spelling. The WORD is standardised on a total of 4252 children with an age range of 5 years to 19 years. The advantage of the WORD is that it is comprehensive and a composite score can be given across the 3 measures. In addition it yields age equivalent scores which can be descriptively compared with literacy age equivalents scores at the previous time points.

- **2.2.3) Language**

Language functioning at time 1 and time 2 was assessed primarily using two different tests. The first of these, the *Reynell Developmental Language Scales* assesses both expression and comprehension (Reynell 1969). The ceiling for these scales is 6 years and therefore they were not appropriate for the DLD participants in adult life. The second of these tests was the *Peabody Picture Vocabulary Test (PPVT)* (Dunn 1959). This measures receptive vocabulary and provided a further estimate of verbal abilities, in addition to the verbal scales of the *Wechsler Intelligence Scales for Children* (WISC) (Wechsler 1949) used at time 1. The previous study (time 3) assessed receptive language with the *British Picture Vocabulary Scales (BPVS)* (Dunn et al 1982). For the current study, the *British Picture Vocabulary Scales (BPVS)* (Dunn et al 1982) was also used for the purpose of continuity. The long version of the BPVS was used which comprises of 150 stimuli. A word is read out to the participant who then has to select the corresponding picture from a choice of four. The BPVS is a well

standardised and widely used assessment of receptive language.

Expressive vocabulary was measured using the upper form of the *Expressive One-word Picture Vocabulary test* (EOPVT) (Gardner 1979) which was also used at the previous assessment (time 3). The EOPVT consists of 70 pictures which increase in difficulty from concrete objects such as “scales” to more abstract concepts such as “time”. The participant is required to give a single word response to each item. The EOPVT is standardised on an American population from the ages of 12 years to 15 years 11 months and therefore minor adjustments were made to make it more suitable for a British group. The symbols for 3 items (water, dentist and prescription) were felt to be too obscure and inappropriate for a British population and therefore were removed. Consequently, the total score was pro-rated to provide a raw score that was then converted to an age equivalent using the tables provided in the test manual.

Syntactic and semantic understanding

The Oral Comprehension Test (Mawhood 1995) based on the *Neale Reading Test* (1958) was used to assess the overall process of oral comprehension including the understanding of semantics and syntactic rules. Again, this was used at the previous assessment (time 3). Three short passages of increasing complexity are read out to the participant who then has to answer questions which test his understanding of the passage he heard. The questions are scored either correct or incorrect and the total correct responses recorded and totalled for each participant. The totals can then be compared between participants and participant groups. A copy of the passages and answers are in appendix 2.

- **2.2.4) Theory of Mind**

Theory of mind or social cognition was not assessed in the three previous studies. The poor social functioning of the DLD group in their 20s (time 3) raised the hypothesis that difficulties in social functioning could be related to a deficit in social cognition or secondary to a general receptive and expressive language deficit. It is suggested that normal social communication requires inferences to be made about other peoples' intentions and beliefs (Baron-Cohen 1989). It has been suggested that "high level" theory of mind deficits are only uncovered by tests which tap into the understanding of communication which involves irony, sarcasm, humour, lying etc. Due to the unspecified nature of theory of mind, three "second order" adult theory of mind tasks were chosen. In a "first order" task, the participant only has to infer the thoughts of another person whereas a "second order" task involves the participant reasoning about what one person thinks about another person's thoughts and is therefore considered to be more complex and suitable for adult populations.

The Eyes Task (Baron-Cohen, Jolliffe, Mortimore & Robertson 1997) consists of photographs of the eye region of twenty five different male and female faces. There are two mental state terms printed under each picture. The participant is given the probe "Which word best describes what this person is feeling or thinking?" The participant then has to choose a mental state term and the response is scored as either correct or incorrect with a possible maximum score of twenty five.

Baron-Cohen et al (1997) used the Eyes Task with three populations. A group of 16 participants with Aspergers syndrome (AS) or high functioning autism (HFA), 10 participants with Tourettes syndrome and 50 age matched adults. All participants had

obtained normal intelligence above 85 on the WAIS-R (Wechsler 1992). The participants were also tested on Happé's *Strange Stories* (Happé 1994) as another second order theory of mind task to see if performance on the two tasks would correlate. In addition, two control tasks were administered, a gender recognition task and an emotion recognition task

Both the control groups performed significantly better than the AS/HFA group. Furthermore, the pattern of results from the eyes task mirrored the pattern of performance on the *Strange Stories Task* and the deficit on the *Eyes Task* of the AS/HFA group was not apparent on the two control tasks. Baron-Cohen et al (1997) therefore provided justification that the *Eyes Task* was a valid measure of theory of mind.

The Strange Stories task (Happe 1994) (appendix 3) is also considered to be a second order theory of mind task. The *Strange Stories Task* used for this study consisted of twenty two stories falling into twelve types of stories with two examples for each type. The eleven types were: pretend, joke, lie, white lie, figure of speech/idiom, misunderstanding, double bluff, sarcasm, persuasion, contrary emotion and appearance/reality. For each story there are two questions, a mental state question and a comprehension check question. The answers given for the comprehension questions were scored as either correct or incorrect. The justifications given in response to the mental state questions were also rated as either correct or incorrect. A justification could be incorrect if it involved errors about the facts given in the story, or if it involved an inference that was inappropriate as a reason for the story character's utterance.

For the mental state questions, only one score was given per story, giving the participant credit for their “best” answer. If a participant gave one correct answer and one inappropriate answer, the correct answer was taken. In addition, if an answer appealed to both physical and mental states, the justification would be scored as mental state.

The participant reads the story or it is read out and then answers the questions at the end of each story. A maximum score of twenty two could be obtained, eleven for the comprehension questions and eleven for the mental state questions.

The Awkward Moments task (Phillips & Newman 1994) is a computer based task which consists of seven well known television advertisements and a clip from the well known television series “Coronation Street”. The items are programmed to run on a laptop computer from a cd rom. After each item, two questions appear on the screen. The first question is a theory of mind question and the second a general comprehension question to assess whether the participant has understood the item. As many viewings of the items as the participant wants is allowed.

In total there are eight comprehension questions and eight theory of mind questions. Responses are scored as either correct or incorrect. Some normative data is available from a research project (Heavey 1999) using the same task at the Institute of Psychiatry, London.

Assessing comprehension using the film clips in the *Awkward Moments Task* provides a closer approximation to the real social world because the social interaction proceeds rapidly and in a more complex way. This task is therefore considered to be a more ecologically valid theory of mind task than the *Eyes Task* or the *Strange Stories Task*.

Three tasks were used to assess social cognition (the *Eyes Task*, *Strange Stories Task* and the *Awkward Moments Task*) because the findings from social cognition tasks have been inconclusive. It was hypothesised that using three tasks to potentially tap into different aspects of the theory of mind construct was a more valid indicator than relying on a single measure.

- **2.2.5) Memory**

Memory was also not assessed in the three previous studies. However, in recent years, memory, particularly phonological processing has come to be considered as a possible non linguistic underlying cause of developmental language disorders. A current hypothesis regarding the nature of developmental language disorders is that children with DLD have an impaired phonological loop component of working memory particularly within the phonological store where there is thought to be impaired phonological representation (Gathercole & Baddeley 1990). This is thought to have implications for both vocabulary and literacy development.

It was therefore important to investigate whether the DLD population had persisting deficits in their phonological processing abilities as according to Gathercole and Baddeley's hypothesis these could be persisting and underlying deficits. The *Children's Test of Nonword Repetition* (Gathercole, Willis, Baddeley et al 1994) has

been in publication since 1994. An adult version of this test called the *Adult Test of Nonword Repetition* (Gathercole & Baddeley 1996) has also been developed but only in the form of a research tool. Preliminary normative data is available for this test (Gathercole & Baddeley 1996).

The test consists of twenty eight nonsense words ranging from two to six syllables which are auditorily presented but with the mouth covered to prevent lip-reading. The participant is instructed to repeat the nonsense words correctly. A score of one is given for each correct repetition. The responses were taped so that both online scoring and a later analysis could be done to ensure the test was scored correctly. The task is in appendix 4.

In addition to phonological processing, verbal short term memory was also investigated. *The Sentence Repetition Test* is a subtest of the multi-lingual aphasia examination (Benton & deS Hamsher 1989). Form A was used which consists of fourteen sentences of increasing length. The sentences are read out one at a time and have to be repeated by the participant. A score of one is awarded for each correct repetition. The responses were again recorded to aid accurate analysis.

The test has been standardised on a control population. Raw scores are adjusted for the number of years of education the participant has received. Scores are then assigned to categories ranging from severely defective to superior.

The *Adult Test of Nonword Repetition* and the *Sentence Repetition Test* assessed verbal short term memory and phonological processing. It was therefore important to

use a control memory measure so that possible deficits in phonological processing and verbal short term memory could not be attributed to overall poor memory ability. *The Doors and People* (Baddeley, Emslie & Nimmo-Smith 1994) memory assessment was chosen as a control memory measure to the nonword repetition test and the sentence repetition test. The Doors and People is a test of visual and verbal recall and recognition. It consists of six sections, immediate verbal recall, visual recognition, delayed verbal recall, immediate visual recall, verbal recognition and delayed visual recall.

An overall score can be obtained by using the majority of the data from the entire assessment which can then be broken down to compare verbal and visual scores and to contrast recall and recognition. The test then gives indices of visual-verbal discrepancies, recall-recognition discrepancies and overall forgetting scores.

The Doors and People Test is standardised on a population of two hundred and thirty eight adults with approximately equal numbers of men and women in each category from each of the four age bands, 16-31, 32-47, 48-63, 64-79.

- **2.2.6) ASSESSMENT OF SOCIAL ADAPTATION**

- I. Social/Emotional and Occupational Functioning**

At time 3, the informant and subject versions of the *Socio-Emotional Functioning Interviews* (*SEF – I and SEF – S*) (Rutter, LeCouteur, Lord et al 1988) were conducted with the DLD group and their informants. This provided very reliable and accurate information about the DLD participants' current life and previous life events and episodes since they were seen in middle childhood (time 2). Therefore, the same

interview procedure was used for the current study. The SEF – S and SEF – I were scored during the interviews and tape recorded for further validation.

II. Informant interview

Informants were asked to provide information about the experiences and functioning of the participants in a wide range of areas. The questions and codings that were used to provide structure for this interview came from the informant version of the Socio-Emotional Functioning Interview (SEF (I)) (Rutter, Le Couteur, Lord et al 1988). This was devised to investigate aspects of socio-emotional functioning in high-functioning autistic adults. The broad areas dealt with are: living arrangements, aspects of current work, friendships and social relationships, heterosexual and homosexual relationships, marriage, fantasies, dreams and self image.

III. Participant interview

The participants themselves were also asked to provide information about their own experiences and functioning. The subject version of the Socio-Emotional Functioning Interview (SEF (S)) was used to do this. The major difference between the versions is that the informant version is mainly factual whereas the subject version allows examination of the way in which the subject himself perceives various issues. The interview covers areas such as: friendships, work and work related problems, sexual relationships, fantasies and day dreams, self image and wishes for the future.

The informant and subject versions of the SEF have been developed in association with the Department of Child and Adolescent Psychiatry at the Institute of Psychiatry, London and are investigator based interviews. Investigator based interviews specify

the range of behaviours to be covered and provide details of the predetermined coding for each behavioural item. There is an initial compulsory probe for each behavioural item and the interviewer, who needs to be highly trained, both on how to question effectively, and on the conceptual distinction and differentiation required for each coding, then needs to probe further until there is sufficient information to distinguish which rating should be given to the behaviour in question

- **2.2.7) Adult Psychopathology**

The unexpected finding of two cases of psychosis at time 3 (early twenties) emphasised the importance of measuring current and lifetime psychopathology associated with developmental language disorders. This was achieved by using self report rating scales to measure general psychopathology and personality and a brief psychosis instrument followed by detailed interview in screen positive cases.

The Malaise Inventory (Rutter, Tizard & Whitmore 1970) (appendix 5) is a self report questionnaire designed to assess an individual's current mental health. It consists of twenty four items or questions which investigate the emotions e.g. Do you often feel miserable or depressed? or aspects of the physical state e.g. Is your appetite poor? that are indicative of psychological distress.

The Malaise Inventory was adapted from the *Cornell Medical Index Health Questionnaire (CMI)* (Brodman, Erdman, Lorge et al 1952). The CMI is a self report inventory consisting of a hundred and ninety five questions. The CMI is considered to be a good indicator of emotional disturbance that agrees with independent psychiatric assessment. Fourteen of the questions from the CMI were taken directly from the

CMI to construct the Malaise Inventory. All of the twenty four items were chosen to sample the different types of emotional disturbance commonly seen in adults.

The participants were asked to complete the Malaise Inventory at the end of the assessment session. If a participant was unable to read the items the examiner went through the inventory with him.

The Schizotypal Personality Questionnaire (SPQ) (Raine 1991) is a self report scale modelled on DSM-III R (American Psychiatric Association) criteria for schizotypal personality disorder, it contains subscales for all of the nine schizotypal traits. These are ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behaviour, no close friends, odd speech, constricted affect and suspiciousness. The SPQ was included to provide a dimensional measure of vulnerability to psychosis, possibly associated with developmental language disorders, as well as social impairment. Altogether there are seventy four items. The participant has to read the questions and either agree or disagree with the question by giving a yes or no answer. The SPQ is in appendix 6.

Raine (1991) in the development of the SPQ used a criterion of having to have five traits out of the nine categories for a DSM-III R diagnosis of schizotypal personality disorder. The SPQ was found to have high sampling validity(0.91), high internal validity (0.91), tests-retest reliability (0.82), convergent validity (0.59 to 0.81), discriminant validity, and criterion validity (0.63, 0.68).

The Australian Psychosis Screen Form A modified from the Psychosis screening questionnaire (Bebbington & Nayani 1995) was used as a quick screen for psychosis. This consists of a short structured interview with probes which identifies individuals who have ever had (now or in the past) a psychotic disorder. If the screen was positive this indicated that further assessment was needed.

If the self report scales and psychosis screen showed any evidence of features of schizophrenia *the Schedule for Schizophrenia and Affective Disorders - Lifetime Version (SADS-L)* (Endicott & Spitzer 1978) was used to investigate the features further. The SADS-L is an investigator based interview to determine whether an individual can meet the criteria for disorders such as major depressive syndrome and schizo-affective disorder.

When participants showed histories of psychosis, medical notes from their GPs and psychiatrists were obtained in order to provide information regarding the exact nature of their diagnoses. A DSM IV diagnosis was then made using consensus – best estimate by diagnostic conference with two psychiatrists reviewing the SADS –L, medical notes and discussion of the case.

- **2.2.8) Economic assessment**

A new and final aspect of the current study aimed to assess the economic cost of the DLD group within the areas of the type and extent of service provision they had received and benefited from during their lives.

The Client service Receipt Inventory (CSRI) (Beecham & Knapp 1992) (appendix 7)

is a structured investigator - based interview to determine the costs of supporting people with disabilities. The interview is given to both the subject and an informant. The areas covered include types of services received such as speech and language therapy, the number and length of time welfare benefits have been received and the burden of participants on the carers. Lifetime costs are then calculated on the basis of the information collected.

2.3 PROCEDURE

The majority of the data was collected through a direct assessment and interview with the DLD participants and the two control groups. The DLD group and sibling group were based throughout the UK whereas the IQ match group was located in Nottingham and the Nottingham area.

It was also necessary to obtain information about relevant life episodes and events over the period since the previous follow up and so for each participant of the DLD group and sibling group a close relative was interviewed, preferably a parent, but where none was available, anyone else who knew the participant well and therefore could act as a valid informant. As well as providing information that the participants may not have been able to supply themselves, the informant interview was helpful in elucidating or verifying information provided by the participants.

2.4 ANALYSES: BACKGROUND AND STRATEGY

Measurement data

Parametric statistics were used with careful consideration of sample sizes, distributions and variances. The cognitive data was initially examined using

scatterplots and box plots to determine the distribution. The Levene test for homogeneity of variance tested the null hypothesis that the groups came from populations with the same variance. Where variances were unequal, the data was transformed to reduce its skewness. Transformation involved analysing the distribution of the data to determine the direction of the skew. Where variables were positively skewed, square root and log transformations were made. Where variables were negatively skewed, they were first reflected and the appropriate transformation for the skewness applied.

Multivariate analyses of variance (MANOVA) were run with a multicomparison procedure to adjust the observed significance level according to the number of comparisons made. The Bonferroni test was used as the multi comparison procedure. This was followed by a univariate analysis of variance (ANOVA) with verbal and full scale intelligence as co-variables to control for the effects of intelligence in the analysis. The Student Newman Keuls (SNK) a posteriori test further explored significant ANOVA effects. The SNK post hoc test was chosen as it enables comparison of three or more groups and has a low error rate at this level of comparison. All reported tests of significance were two tailed. For the intelligence and language data, scores of the DLD group from the assessment in their twenties (time 3) and in their thirties (time 4) were compared using a single sample t test for repeated measures. The difference between the means on the same assessments at different times was computed.

Categorical data

Crosstabulations were used to calculate observed and expected frequencies and the

associations between them. A Fisher's exact test was the most appropriate significance test due to the small total sample size and expected cell values.

Items from the *Social Emotional functioning Interviews (SEF- S and I)* in the social adaptation analyses were selected for analysis if they had also been measured at adult outcome in the National Child Development Study (NCDS) cohort. This then enabled valid comparisons across the DLD adults, siblings and NCDS cohort.

Longitudinal data

Obviously, the longitudinal data formed a valuable aspect of the study. Utilising the longitudinal data across the four time points was primarily complicated by differing assessments, changing sample sizes and shifting points of interest. As a result, it was not always viable to make comparisons using statistical techniques and therefore descriptive measures were employed.

All statistical analyses were performed using the statistical package of the Social Sciences (SPSS) computing programme for Windows, version 9.0.

CHAPTER THREE: RESULTS

SECTION 3.1: COGNITIVE RESULTS

This section presents the findings from the current study. A cognitive profile across intelligence, language, literacy, social cognition and memory in male adults with a childhood diagnosis of developmental language disorders (DLD) is described. This section is divided into the following five sub sections. The *first* sub section examines the chronological age and intelligence profiles across the DLD cohort, siblings and IQ match group. The *second* examines receptive and expressive language abilities. The *third* determines the literacy abilities of the three groups within reading, reading comprehension and spelling. The *fourth* investigates memory processing within visual and verbal recall and recognition. The fifth explores phonological processing and verbal short term memory. The *sixth* examines social cognition and the *seventh* analyses the relationships within the cognitive profile of developmental language disorders. Within the sections of intelligence, language and literacy, the profile of the DLD group from the follow up into their twenties (time 3) is compared to the profile found at this current follow up (time 4). This will be expanded upon in Chapter four when the longitudinal patterns of the abilities of the DLD group over the four time points from childhood to this current follow up are examined. Due to the large number of results produced, a brief discussion follows each section. This is so the interpretation of results is easier to understand and allows a progression of analyses, rather than producing a large series of sections (a general overall discussion follows in chapter four).

The DLD group are compared against two comparison groups, a non language disordered sibling group and an IQ match group. A non language disordered sibling

group was used in order to determine whether the cognitive profile of the DLD group is attributable to their initial diagnosis of a developmental language disorder or to their family background.

An IQ match group was recruited to match the DLD group on age, gender and performance IQ in order to control for the effect of performance IQ. Verbal IQ was not chosen as a matching variable because verbal IQ was significantly lower than performance IQ in the DLD cohort. Therefore, it was not possible to match a single comparison group on both measures without increasing the risk of recruiting a group with concomitant language difficulties.

3.1.1) CHRONOLOGICAL AGE AND INTELLIGENCE PROFILE

Description and analysis of the chronological age profiles and intelligence profiles of the DLD group, sibling group and IQ match group are presented here.

CHRONOLOGICAL AGE

All three groups were in their mid thirties: the DLD group at 36 years and 2 months (S.D. 1.25), the Sibling group at 36 years and 10 months (S.D. 6.04) and the IQ match group at 36 years and 8 months (S.D. 2.2). A one way analysis of variance (ANOVA) was performed with group as the independent variable and chronological age as the dependent variable. This revealed a non significant age difference between the groups.

INTELLIGENCE PROFILE

Statistical analysis

Figure 3.1.1 compares the intelligence profiles of the three groups. Table 3.1.1a is a description of the IQ data for each of the three groups. The Levene test for homogeneity of variance revealed that the variances of the three groups were unequal for verbal IQ ($p < 0.01$), performance IQ ($p < 0.01$) and full scale IQ ($p < 0.001$). The IQ variables were therefore transformed to reduce their skewness. Verbal IQ and full scale IQ were positively skewed so a square root transformation was used. Performance IQ was moderately positively skewed and transformed using a log transformation. One way analysis of variance was then performed for each of the three IQ variables. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with p set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group

versus the sibling group and (b) DLD group versus the IQ match group. Comparisons of the intelligence profile of the DLD group from the follow up into their twenties (time 3) to this current follow up (time 4) was performed using data from the WAIS – R (Wechsler 1992). A matched sample t test was used to analyse the difference between the means.

Table 3.1.1a Description of the IQ data for each of the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
VIQ	Direction	Normal	Moderate positive	Normal
PIQ	Direction	Moderate negative	Normal	Moderate positive
FSIQ	Direction	Normal	Normal	Normal

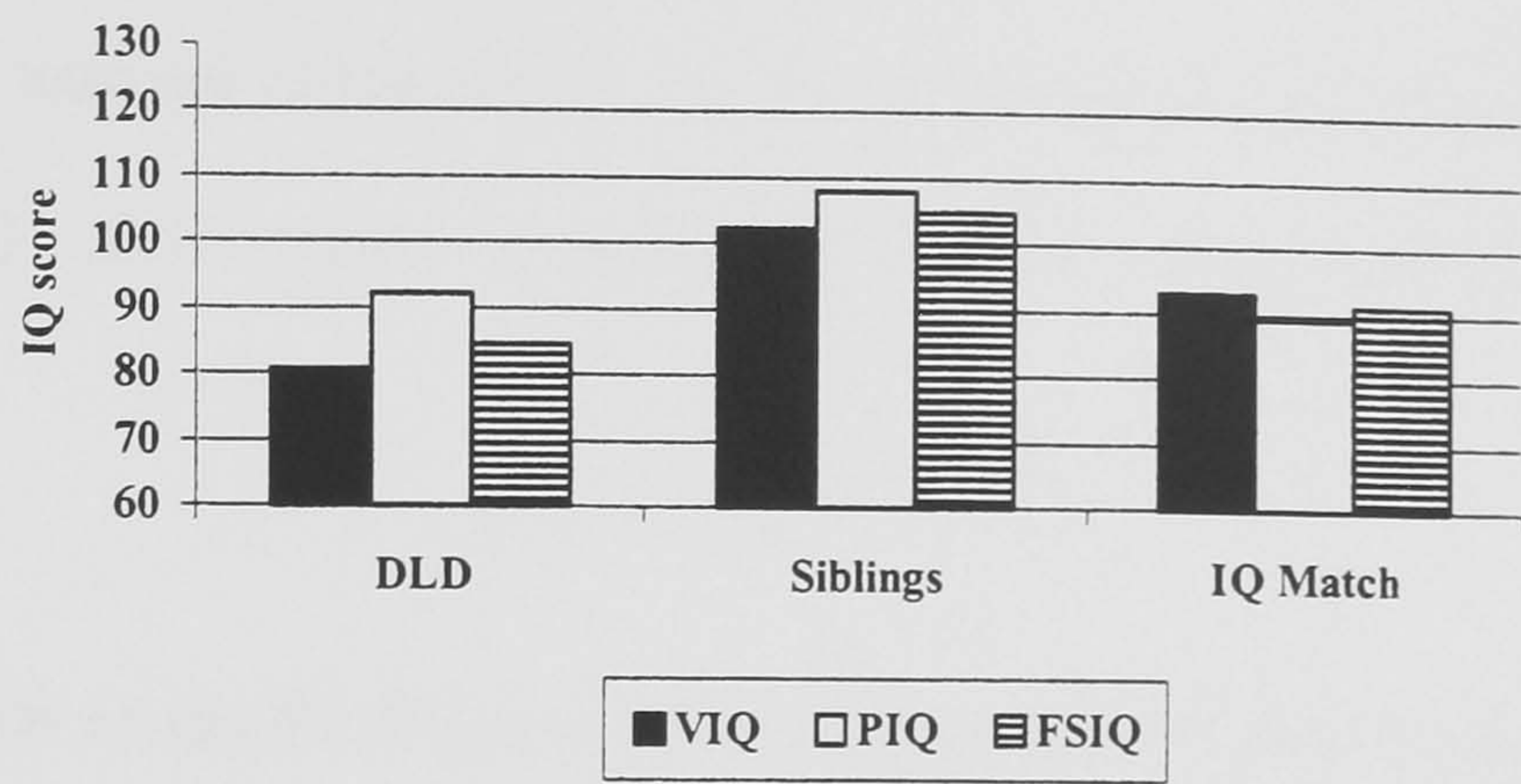
Verbal IQ (VIQ)

The DLD group had the lowest mean score of 80.7 (S.D. 8.0) and the sibling group the highest mean score of 102.1 (S.D. 8.6) with the mean score of the IQ match group at 93.2 (S.D. 1.0). All three groups performed within the normal range. A one way analysis of variance revealed a significant effect ($F = (2, 47) = 11.9; p<0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the sibling group ($p<0.001$) and (b) the DLD group and the IQ match group ($p<0.01$).

Performance IQ

The mean score of the DLD group was 92.1 (S.D. 7.0) matching the mean score of the IQ match group at 89.3 (S.D. 6.2). In comparison, the sibling group had a much higher mean score of 108.0 (S.D. 9.2). All three groups performed within the normal range. A one way analysis of variance revealed a significant effect ($F (2, 47) = 7.1; p<0.01$).

Figure 3.1.1 Comparison of verbal IQ (VIQ), performance IQ (PIQ) and full scale IQ (FSIQ) across the DLD group, Siblings and IQ match group



The post hoc SNK test identified (a) a significant difference between the DLD group and the sibling group ($p<0.01$) and (b) a non significant effect between the DLD group and the IQ match group due to the matching of the IQ match group to the DLD group on performance IQ.

Full scale IQ (FSIQ)

The DLD group had the lowest mean score of 84.4 (8.3) and the sibling group the highest mean score of 105.0 (S.D. 8.0). Due to the matching of the IQ match group to the DLD group on performance IQ, the resulting full scale IQ score of the IQ match group was 91.3 (S.D. 6.6). A one way analysis of variance revealed a significant effect ($F(2, 47) = 9.8; p<0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the sibling group ($p<0.001$) and (b) a non significant difference between the DLD group and the IQ match group ($p = .093$).

The DLD adults and the siblings had higher mean performance IQ scores than mean verbal IQ scores. Only the DLD group ($p<0.05$) and the sibling group ($p<0.05$) had significantly higher performance IQ scores than verbal IQ scores (Wechsler 1992). This discrepancy was not replicated by the IQ match group and therefore supports a possible verbal IQ – performance IQ discrepancy specific to only the DLD group and sibling group.

Intelligence profile of the DLD group from their twenties (time 3) to their thirties (time 4)

Table 3.1.1b compares the verbal and performance IQ profile of the DLD group from time 3 to time 4.

Table 3.1.1b Intelligence profile of the DLD cohort from their twenties (time 3) to their thirties (time 4)

IQ		Time 3 (N = 19)	Time 4 (N = 17)	Change score <i>t</i> (p value)
Verbal IQ	Mean	75.4	80.7	1.4 (ns)
	(S.D)	(12.1)	(8.0)	
Performance IQ	Mean	82.3	92.1	9.2 ($p<0.001$)
	(S.D)	(9.4)	(7.0)	

A discrepancy in IQ scores was identified from the follow up of the DLD group into their twenties (time 3) and those found at this current follow up (time 4). The complete WAIS – R (Wechsler 1981) was administered at time 3 and a short form at time 4. Reanalysis of the time 3 IQ data using the current short form found the mean verbal IQ score to be 75.4 compared to 80.7 at time 4 and the mean performance IQ to be 82.3 compared to 92.1 at time 4. Even with the reanalysis, a significant discrepancy remains between the time 3 and time 4 performance IQ scores ($t(18) =$

9.2; $p < 0.001$). Although the analysis contained two fewer DLD participants than at time 3, this does not adequately explain the discrepancy. Possible explanations are discussed in section 4.1, which further explores the longitudinal pattern of intelligence from childhood to this follow up.

SUMMARY OF FINDINGS

1. The three groups had similar mean chronological ages, all being in their mid thirties.
2. The verbal IQ, performance IQ and full scale IQ scores of all the three groups were within what is considered to be the normal range, i.e. above 70 IQ points. The sibling group gained the highest mean scores and therefore were functioning at a significantly higher level than the DLD group. The full scale IQ of the DLD group was approximately one standard deviation below the population mean. The criterion for global learning disability is two standard deviations below the population mean. Therefore, the DLD group do not have a global learning disability.
3. The DLD group was matched to the IQ match group on performance IQ only in order to control for the effect of performance IQ. Only the DLD group and the sibling group had a significantly higher performance IQ than verbal IQ supporting a possible verbal IQ – performance IQ discrepancy pattern specific to only the DLD group and their siblings. In comparison, the IQ match group had an opposite pattern with a slightly lower performance IQ than verbal IQ.
4. Not all follow up studies have measured either verbal or performance IQ despite using participants with diagnoses of developmental language disorders which by definition are expected to have normal performance IQ. At this assessment, the

DLD group did have normal PIQ scores and therefore still meet the criteria of developmental language disorder. For the follow up studies which have used a measure of intelligence at the time of follow up and valid criteria including normal performance IQ to diagnose DLD at the initial assessment (Stothard et al 1998, Oki & Cho 1996, Tomblin et al 1992, Aram et al 1984, Paul and Cohen 1984) then the evidence supports that DLD children and adults have performance IQ scores within the normal range, that PIQ is usually higher than VIQ and IQ scores do not deteriorate over time irrespective of functioning in other areas. Such findings are supported by the intelligence profile of the DLD adults identified at this follow up.

CONCLUSION

The chronological age profile of the three groups was very similar. However, the intelligence profile of the DLD group differed from the sibling group. The verbal IQ, performance IQ and full scale IQ abilities of the DLD group were much lower than the sibling group with verbal IQ being very much at the lower end of the considered normal range. The only similarities between the DLD group and the sibling group were their chronological ages and higher performance IQ than verbal IQ.

The DLD group were matched to the IQ match group on performance IQ and therefore similarities between these two groups were evident. These included a mean chronological age in the mid thirties and a matched level of performance IQ. In contrast to the DLD group, the IQ match group had a higher verbal IQ than performance IQ which subsequently increased their full scale IQ. The purpose of the IQ match group was to control for performance IQ across the abilities assessed and to

ensure that the performance of the DLD group could not simply be attributed to a lower performance IQ.

3.1.2) RECEPTIVE AND EXPRESSIVE LANGUAGE

The receptive and expressive language profiles of the DLD group, sibling group and IQ match group are presented here. Three tasks were used to measure language; the extended version of the British Picture Vocabulary Scales (BPVS) (Dunn et al 1982) assessed receptive language at the single word level, the Expressive One – Word Picture Vocabulary test (EOPVT) (Gardner 1979) assessed expressive vocabulary at the single word level and the Oral Comprehension Test (Mawhood 1995) was used to assess the overall process of oral comprehension.

STATISTICAL ANALYSIS

Table 3.1.2a displays the raw mean scores of the three groups across the three language tasks. Table 3.1.2b is a description of the language data for each of the three groups. The Levene test for homogeneity of variance found that the variances of the three groups were unequal for the BPVS ($p < 0.01$), the EOPVT ($p < 0.01$) and the Oral Comprehension Task ($p < 0.05$). The three language variables were first transformed to reduce their skewness. The BPVS was moderately negatively skewed so a reflect and log transformation was used. The EOPVT and the Oral Comprehension Task were negatively skewed and subjected to reflect and square root transformations. A multivariate analysis of variance (MANOVA) was used with group as the independent variable and the three language assessments as the dependent variables in which verbal IQ and full scale IQ served as the covariates. Where multivariate analysis was significant, univariate ANOVAs – one for each section – using verbal IQ and full scale IQ as the covariates were conducted across the three groups. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with p set to 0.02 to adjust for multiple comparisons).

The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group. Comparison of the receptive and expressive language abilities of the DLD group from their twenties (time 3) to their thirties (time 4) was performed using a matched samples t test to analyse difference between the means.

Table 3.1.2a Comparison of the raw mean scores of the three groups across the language tasks

Language task		DLD group (n=17)	Sibling group (n=16)	IQ match group (n=17)	Significance test	Post hoc analysis
BPVS	Mean (S.D)	107.2 (7.5)	136.0 (4.4)	138.5 (5.7)	p<0.001	DLD<Siblings, IQ
EOPVT	Mean (S.D)	28.5 (8.5)	47.0 (5.9)	48.4 (6.7)	p<0.001	DLD<Siblings, IQ
Oral Comprehension Task	Mean (S.D)	10.8 (4.1)	15.0 (2.1)	13.4 (3.4)	p<0.05	DLD<Siblings, IQ

Table 3.1.2b Description of the language data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
BPVS	Direction	Moderate negative	Moderate negative	Normal
EOPVT	Direction	Normal	Moderate negative	Normal
Oral Comprehension Task	Direction	Moderate positive	Moderate negative	Normal

The MANOVA revealed a significant main effect of group for language (F (6, 90) = 6.3; p<0.001).

RECEPTIVE LANGUAGE: BRITISH PICTURE VOCABULARY SCALES (BPVS)

Performance on the BPVS revealed that the sibling group and the IQ match group showed a very similar level of receptive language ability where the majority of both these control groups were at the ceiling level. From a maximum possible score of 150, the DLD group had the lowest mean score at 107.2 (S.D. 7.5) and the IQ match group the highest at 138.5 (S.D. 5.7) with the sibling group slightly lower at 136.0 (S.D. 4.4). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant effect ($F(2, 45) = 11.5; p < 0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

The mean age equivalent score of the DLD group was 11 years and 9 months where none of the group reaching ceiling level. In comparison, nine of the siblings and eight of the IQ match group did reach the ceiling level.

EXPRESSIVE LANGUAGE: EXPRESSIVE ONE WORD PICTURE VOCABULARY TEST (EOPVT)

The pattern of performance on the EOPVT paralleled that of receptive language. From a maximum possible score of 67, the DLD group had the lowest mean score of 28.5 (S.D. 8.5), the IQ match group the highest mean score at 48.4 (S.D. 6.7) and the sibling group had a slightly lower mean score of 47.0 (S.D. 5.9). A univariate analysis of variance with verbal IQ and FSIQ as the covariates revealed a significant effect ($F(2, 45) = 8.5; p < 0.001$). The post hoc SNK test found a significant

difference between (a) the DLD group and the sibling group ($p<0.001$) and (b) the DLD group and the IQ match group ($p<0.001$).

The mean age equivalent score of the DLD group was 11.01 years with none of the DLD participants at ceiling level. In contrast, six of the siblings and five of the IQ match group did reach ceiling.

ORAL COMPREHENSION TASK

From a maximum possible score of 17, the DLD group gained the lowest mean score of 10.8 (S.D. 4.1) and the sibling group the highest mean score at 15.0 (S.D. 2.1) with the mean score of the IQ match group lower than the siblings at 13.4 (S.D. 3.4). Five members of the sibling group reached the ceiling score of 17 compared to one IQ match participant and none of the DLD participants. A univariate analysis of variance with verbal IQ and FSIQ as the covariates revealed a significant effect ($F(2, 45) = 6.7$; $p<0.02$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p<0.001$) and (b) the DLD group and the IQ match group ($p<0.05$).

LANGUAGE ABILITIES OF THE DLD GROUP FROM THEIR TWENTIES (TIME 3) TO THEIR THIRTIES (TIME 4)

No change was identified in the receptive and expressive language abilities of the DLD group from the follow up into their twenties (time 3) (Mawhood et al 2000) to this follow up into their mid thirties (time 4). Table 3.1.2c displays the mean age equivalent scores achieved at time 3 and time 4.

At the last follow up of the DLD group, the mean BPVS age equivalent score was 11.02 years, which was approximately the same as the age equivalent score of 11.09 years identified at this assessment. The mean EOPVT age equivalent score of the DLD group at time 3 was 10.09 years and 11.01 years at time 4. Finally, the mean oral comprehension score of 10.4 at time 3 did not differ from the mean score of 10.8 at this follow up.

Table 3.1.2c Comparison of BPVS and EOPVT age equivalent (AE) scores in years and oral comprehension raw scores of the DLD group from time 3 to time 4

Language task		Time 3 N = 19	Time 4 N = 17	Change score <i>t</i> (p value)
BPVS AE scores	Mean	11.02	11.09	1.54 (ns)
	(S.D)	(2.5)	(3.1)	
EOPVT AE scores	Mean	10.09	11.01	1.23 (ns)
	(S.D)	(3.8)	(4.0)	
Oral comprehension Raw scores	Mean	10.4	10.8	1.33 (ns)
	(S.D)	(3.9)	(4.10)	

Analysis of change over time using a single sample t test for repeated measures revealed no significant differences from time 3 to time 4 for the three language assessments. Therefore there was no significant improvement or deterioration in the language abilities of the DLD group.

SUMMARY OF FINDINGS

1. The DLD group had a significantly poorer performance than both the sibling group and the IQ match group on the BPVS, the EOPVT and the oral comprehension test. The receptive and expressive language age equivalent scores of the DLD group were very much below what would be expected considering their chronological age.

2. The sibling group and the IQ match group had very similar levels of receptive and expressive language ability as assessed by the BPVS and the EOPVT. Neither of the control groups was found to have deficits in their language abilities. Due to the failure of the standardisation ranges of the BPVS and EOPVT to extend into an adult age range, it is difficult to accurately state the exact receptive and expressive language abilities of the sibling group and IQ match group other than to say that they were very much superior to the DLD group.
3. Verbal IQ and full scale IQ were used as covariates in the analysis indicating that in particular, the verbal IQ abilities of the DLD group did not contribute to their impaired performance on the language tasks.
4. The language abilities of the DLD group had neither significantly deteriorated nor improved since the follow up into their twenties.

CONCLUSION

Performance on the language assessments showed that in adult life, the DLD group had severe deficits in both their receptive and expressive language abilities compared to both the control groups. The language abilities of the DLD group were very much below those expected considering that their chronological age was in their mid thirties.

Of the relatively limited follow up studies which have assessed language outcome, children with an initial diagnosis of developmental language disorder continue to have both receptive and expressive language deficits both in adolescence and early adult life (Stothard et al 1998, Tomblin et al 1992, Aram et al 1984, King et al 1982, Hall & Tomblin 1978). The language outcome of the DLD group in their mid thirties

supports these findings, identifying that their language deficits did not improve from their twenties and neither had they resolved since their initial diagnosis in childhood (Bartak et al 1975).

Overall, the assessment of language functioning showed that in adult life the DLD group had significant and persisting impairments in receptive and expressive language which cannot be explained by either low IQ or family background. No significant improvement in language abilities was identified in the transition from early adult life to their mid thirties, supporting the initial diagnosis of a developmental language disorder as opposed to a language delay.

3.1.3) LITERACY

The literacy abilities of the DLD group, sibling group and IQ match group are presented here. The Wechsler Objective Reading Dimensions (WORD) (Wechsler 1993) consisting of three sections measuring basic reading, reading comprehension and spelling assessed the literacy abilities of the DLD group, sibling group and IQ match group.

STATISTICAL ANALYSIS

Table 3.1.3a compares the raw scores gained by the three groups across the WORD subtests. Table 3.1.3b is a description of the literacy data for each of the three groups. Figure 3.1.3 compares the age equivalent scores obtained on the WORD subtests. The Levene test for homogeneity of variance revealed that the variances of the three groups were unequal for basic reading ($p < 0.05$), reading comprehension ($p < 0.05$) and spelling ($p < 0.05$). The basic reading, reading comprehension and spelling variables were first transformed to reduce their skewness. The three literacy variables were negatively skewed and subjected to reflect and square root transformations. A multivariate analysis of variance (MANOVA) was used with group as the independent variable and the three language assessments as the dependent variables in which verbal IQ and full scale IQ served as the covariates. Where multivariate analysis was significant, univariate ANOVAs – one for each variable – using verbal IQ and full scale IQ as the covariates were conducted across the three groups. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with p set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group. Comparison of the literacy

abilities of the DLD group from their twenties (time 3) to their thirties (time 4) was performed using descriptive analysis.

Table 3.1.3a Comparison of the raw scores across the DLD group, Siblings and IQ match groups on the WORD

WORD subtest		DLD group (n=17)	Sibling group (n=16)	IQ match group (n=17)	Significance test	Post hoc analysis
Basic reading	Mean (S.D)	36.2 (8.8)	50.5 (6.9)	51.8 (3.8)	p<0.001	DLD<Siblings, IQ
Reading comprehension	Mean (S.D)	21.9 (6.0)	32.8 (5.3)	33.1 (3.0)	p<0.01	DLD<Siblings, IQ
Spelling	Mean (S.D)	28.0 (3.4)	40.3 (9.6)	41.1 (6.5)	p<0.001	DLD<Siblings, IQ

Table 3.1.3b Description of the literacy data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
Basic reading	Direction	Normal	Moderate negative	Substantial negative
Reading comprehension	Direction	Normal	Normal	Moderate negative
Spelling	Direction	Normal	Normal	Moderate negative

The MANOVA revealed a significant main effect of group for literacy ($F(6, 90) = 9.6; p<0.02$).

BASIC READING

Out of a possible total score of 55, the DLD group had the lowest mean score of 36.2 (S.D. 8.8) and the IQ match group the highest of 51.8 (S.D. 3.8) with the siblings gaining a slightly lower score of 50.5 (S.D. 6.9). A univariate analysis of variance with verbal IQ and full scale IQ as covariates revealed a significant effect ($F(2, 45) = 15.1; p<0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the Sibling group ($p<0.001$) and (b) the DLD group and the IQ match group ($p<0.001$). The mean basic reading age equivalent score of the DLD

group was 9 years and 8 months. None of the DLD group reached ceiling level compared to ten of the siblings and eleven participants of the IQ match group.

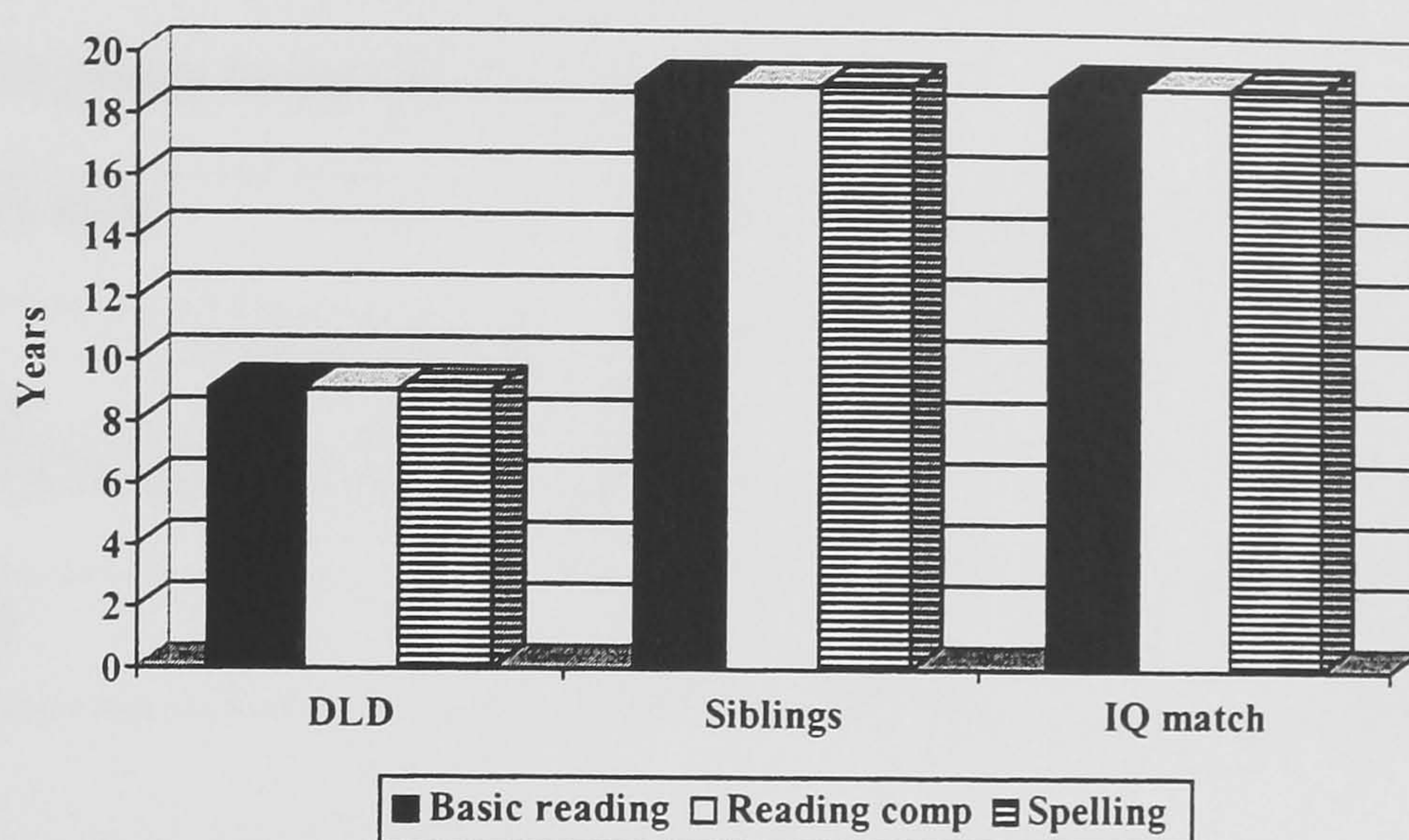
READING COMPREHENSION

A similar pattern of performance to the basic reading section was found on reading comprehension. From a possible total score of 38, the DLD group had the lowest mean score of 21.9 (S.D. 6.0). Again, the IQ match group gained the highest mean score of 33.1 (S.D. 3.0) with the siblings slightly lower at 32.8 (S.D. 5.3). A univariate analysis of variance with verbal IQ and full scale IQ as covariates revealed a significant effect ($F(2, 45) = 17.8; p < 0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the Sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$). The mean reading comprehension age equivalent score of the DLD group was 9 years and 5 months. None of the DLD group reached ceiling level compared to ten of the siblings and eight members of the IQ match group.

SPELLING

The pattern of performance identified on the basic reading and reading comprehension sections was replicated on the spelling section. From a total possible score of 43, the sibling group (mean = 40.3, S.D. 9.6) and the IQ match group (mean = 41.1, S.D. 6.5) had similar high scores with the DLD group gaining the lowest mean score at 28.0 (S.D. 3.4).

Figure 3.1.3 Comparison of age equivalent of the WORD subtests across the three groups



A univariate analysis of variance with verbal IQ and full scale IQ as the covariates revealed a significant effect ($F(2, 45) = 7.5; p < 0.01$). The post hoc SNK test identified a significant difference between (a) the DLD group and the Sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$). The mean age equivalent score of the DLD group was 9 years and 5 months. None of the DLD group reached ceiling level compared to nine of the siblings and ten participants of the IQ match group.

LITERACY ABILITIES OF THE DLD GROUP FROM THEIR TWENTIES (TIME 3) TO THEIR THIRTIES (TIME 4)

At time 3, basic reading was measured using the Gray Oral Reading Test (Gray 1967), reading comprehension by a shortened version of the Edinburgh Reading Tests (McBride & McNaught 1985; Pollitt 1977) and spelling with the Schonell Graded Word Spelling test (Schonell & Schonell 1960). At time 4, the WORD (Wechsler

1993) was used to assess literacy abilities. Table 3.1.3c displays the mean age equivalent scores achieved at time 3 and 4.

Table 3.1.3c Comparison of the literacy age equivalent (AE) scores in years of the DLD group from time 3 to time 4

Literacy task		Time 3 N = 19	Time 4 N = 17
Basic reading/reading accuracy	Mean (S.D)	11.16 (4.04)	9.08 (4.02)
Reading Comprehension	Mean (S.D)	10.87 (2.99)	9.05 (3.25)
Spelling	Mean (S.D)	10.82 (3.54)	9.05 (4.05)

It is not statistically valid to compare the mean age equivalent literacy scores obtained at each time point due to the administration of different assessments. However, table 3.1.3c does show that descriptively the scores from each time point do not differ significantly and that for each time point the mean age equivalents obtained by the DLD group were all around 9 to 12 years. Age equivalents which were not at or near the ceiling level of any of the literacy assessments administered. From their twenties to their thirties, the literacy abilities of the DLD group did not improve. Chapter 4 further explores the longitudinal pattern of the literacy ability of the DLD group from childhood to this follow up.

SUMMARY OF FINDINGS

1. The DLD group obtained the lowest mean scores for all of the WORD subtests as compared to the siblings and IQ match group.
2. None of the DLD group scored at ceiling level for any of the three WORD sections compared to the majority of both the comparison groups. Their language

abilities were very much below those expected considering their chronological age.

3. The DLD group exhibited significantly poorer literacy abilities than both the control groups which were independent of verbal IQ and full scale IQ. Therefore, the verbal IQ of the DLD group did not explain their poor performance on the literacy assessments.
4. The literacy abilities of the DLD group in their mid thirties had not improved since the follow up into their twenties.

CONCLUSION

Those follow up studies which have investigated the literacy abilities of developmental language disorders have found literacy deficits to be present in those participants with developmental language disorders compared to language and age matched controls and controls with resolved language impairments (Stothard et al 1998, Aram et al 1984, King et al 1982, Aram & Nation 1980, Tomblin & Hall 1978). The literacy outcome of the DLD group in their mid thirties supports these findings. Significant literacy deficits that have not resolved over time were identified in the DLD group. The relationship between language disorders and later literacy ability is not clear but children with developmental language disorders do seem to be at greater risk for literacy problems further into their adult lives. The impaired literacy abilities of the DLD group parallel their unresolved receptive and expressive language abilities, therefore suggesting that for the DLD group there is a relationship between their initial language deficits and their impaired literacy abilities.

3.1.4) VISUAL AND VERBAL MEMORY - RECALL AND RECOGNITION

The Doors and People Test of Visual and Verbal Recall and Recognition (Baddeley, Emslie & Nimmo – Smith 1994) was used to assess visual and verbal memory. The following four scales of the Doors and People test were chosen for the analysis: total memory, combined visual memory, combined verbal memory and overall forgetting.

STATISTICAL ANALYSIS

The Levene test for homogeneity of variance revealed that the variances of the three groups (DLD group, IQ match group and sibling group) were equal for total memory, combined visual memory, combined verbal memory and overall forgetting. None of the scores for the four scales of the Doors and People Task were skewed and therefore transformation was not necessary. A multivariate analysis of variance (MANOVA) was used with group as the independent variable and the four scales as the dependent variables, in which verbal IQ and full scale IQ served as the covariates. Where multivariate analysis was significant, univariate analysis of variance (ANOVAs) – one for each of the scales – using verbal IQ and full scale IQ as the covariates, were conducted across the three groups. Significant effects were further explored with a post hoc Student Newman Keuls test to describe group differences with p set at 0.02 to adjust for multiple comparisons. The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

The MANOVA did not reveal a significant main effect of group for the four scales, indicating that the performance of the three groups across the four memory scales did not differ statistically.

TOTAL MEMORY

The DLD group had the lowest mean scaled score of 6.8 (S.D. 3.5) with both the sibling group (mean = 10.2, S.D. 3.0) and the IQ match group (mean = 10.5, S.D. 2.8) performing at a similar average level. A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

COMBINED VISUAL MEMORY

The DLD group gained the lowest mean scaled score of 7.7 (S.D. 2.7) and the sibling group the highest at 10.6 (S.D. 1.5) with the IQ match group slightly lower at 9.5 (S.D.2.5). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

COMBINED VERBAL MEMORY

A slightly different pattern was identified on the combined verbal memory scale. The mean scaled score of the DLD group was the lowest at 7.2 (S.D 3.2) and the IQ match group the highest at 11.4 (S.D. 3.4) with the siblings slightly lower at 9.9 (S.D. 3.5). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

OVERALL FORGETTING

The DLD group had the lowest overall forgetting scaled score of 8.6 (S.D.3.5). The mean scaled scores of the siblings at 10.1 (S.D. 2.2) and the IQ match group at 9.5, (S.D. 3.1) were slightly higher than the DLD group. However, a univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

Although, the DLD group did not differ statistically from the controls, their scores were a good standard deviation lower than the comparisons across all the four memory scales, suggesting some impairment in the visual and verbal recall and recognition abilities of the DLD adults.

Davis, Bradshaw & Szabadi (1999) validated the normative data of the Doors and People using a new sample of normal participants (16-75 years) subdivided into 10 year age bands. A comparison of the mean scaled scores of the DLD adults, siblings and IQ match group to the 36 – 45 year age band of this population is shown in table 3.1.4.

Table 3.1.4 Comparison of performance on the Doors & People of the DLD adults, Siblings and IQ match group to a normative population.

Memory Index	36-45 age band	DLD group (n=17)	Siblings (n=16)	IQ match (n=17)
Total memory	9.2 (3.2)	6.8 (3.5)	10.2 (3.0)	10.5 (2.8)
Combined visual memory	10.1 (2.8)	7.0 (2.7)	10.6 (1.5)	9.5 (2.5)
Combined verbal memory	8.7(3.3)	7.2 (3.2)	9.9 (3.5)	11.4 (3.4)
Overall forgetting	9.4 (3.3)	8.6 (3.5)	10.1 (2.2)	9.5 (3.1)

The mean full scale IQ of the 36 to 45 year age band was 108.0 (S.D. 12.7), which is substantially higher than the DLD adults. Davis et al (1999) found that performance on the Doors & People is correlated with general intellectual level. Higher intelligence predicted increased performance on the Doors and People.

This could explain the non significant but higher scores of the sibling group and normative population compared to the performance of the DLD adults. The lower

scaled scores gained by the DLD adults on the memory indices could be attributable to their generally lower intellectual ability rather than specific deficits in visual and verbal recall and recognition.

However, the DLD group was matched to the IQ match group on performance IQ. The IQ match group had substantially higher scores than the DLD adults. Furthermore, verbal IQ and full scale IQ were covaried in the analysis. This suggests that the visual and verbal recall and recognition abilities of the DLD adults are more complex than simply being attributable to generally lower intellectual ability. Thus, it is possible that they do have impairments in visual and verbal recall and recognition but the nature of this impairment remains to be determined.

SUMMARY OF FINDINGS

1. The DLD group gained the lowest mean scaled scores across the four scales of total memory, combined visual memory, combined verbal memory and overall forgetting.
2. The DLD adults recall and recognition memory was equally affected with no tendency towards material selectivity.
3. Although, the DLD group gained the lowest mean scores for the four memory scales, their performance was not statistically significantly lower than either the siblings or the IQ match group.
4. Although, the IQ match group and the DLD group were matched on performance IQ, the scaled scores of the DLD group were a good standard deviation lower.
5. Verbal IQ and full scale IQ were covaried and therefore the IQ ability of the DLD group did not affect their visual and verbal memory performance.

CONCLUSION

Overall, the DLD group, the sibling group and the IQ match group did not have any statistically significant visual and verbal recall and recognition deficits as measured by the Doors and People Test. However, the DLD adults did have subtle impairments in memory, not reaching statistical significance, which are not explained by their general IQ level. The nature of the visual and verbal recall and recognition abilities of the DLD adults are complex and are discussed further in relation to verbal short term memory deficits in section 3.1.5.

3.1.5) VERBAL SHORT TERM MEMORY

Phonological processing and sentence repetition were the two components of verbal short term memory assessed, the results of which are presented here.

The Adult Test of Nonword Repetition (ANrep) (Gathercole & Baddeley 1996) assessed the phonological processing abilities of the DLD adults, sibling group and IQ match group. Phonological processing relies on the capacity of the phonological loop component of working memory to encode and maintain the novel sequence of a nonword.

The twenty eight nonwords comprising the ANrep were divided equally into (a) four syllable categories ranging from two to five syllables and (b) fourteen nonwords containing consonant clusters termed “articulatory” complex and fourteen nonwords without consonant clusters referred to as “articulatory simple”. Analysis of the ANrep therefore consists of the overall raw score, the effect of syllable length and the effect of articulatory complexity.

The Sentence Repetition Test (Benton & deS Hamsher 1989) was used to assess the overall verbal short term memory abilities of the DLD adults, siblings and IQ match group. The Sentence repetition test is designed to measure the ability to briefly store and retrieve auditory information and has been shown to be a sensitive indicator of residual language impairment (Stothard et al 1998, Tomblin et al 1992).

PHONOLOGICAL PROCESSING: OVERALL SCORE

Statistical analysis

Table 3.1.5a is a description of the ANrep overall score data for each of the three groups. The Levene test for homogeneity of variance revealed that the variances of the three groups) were unequal for the overall score on the ANrep ($p<0.01$). The ANrep variable was negatively skewed and therefore a reflect and square root transformation was used. A univariate analysis of variance (ANOVA) using verbal IQ and full scale IQ as the covariates was conducted across the three groups. Significant group effects were further explored with a post hoc Student Newman Keuls test to describe group differences (with p set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

Table 3.1.5a Description of the ANrep data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
ANrep	Direction	Normal	Substantial negative	Normal

Overall score

From a possible total score of 28, the DLD group gained the lowest mean score of 11.6 (S.D. 5.4) and the IQ match group the highest of 23.6 (S.D. 3.0) with the siblings slightly lower at 23.3 (S.D. 2.8). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant effect ($F(2, 45) = 29.5; p<0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the sibling group ($p<0.001$) and (b) the DLD group and the IQ match group ($p<0.001$).

PHONOLOGICAL PROCESSING: THE EFFECT OF SYLLABLE LENGTH

Statistical analysis

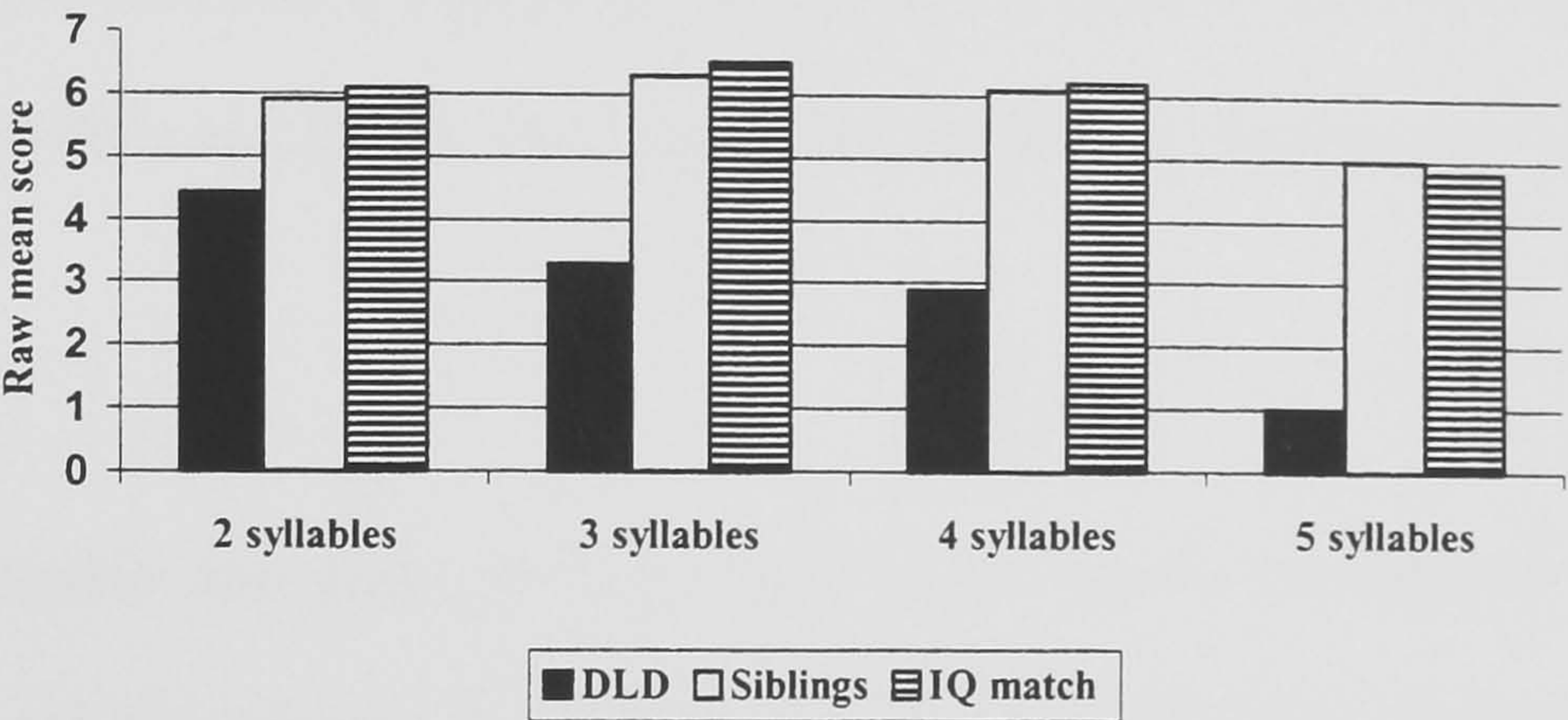
Table 3.1.5b describes the syllable category data for each of the three groups. The Levene test for homogeneity of variance revealed that the variances of the three groups were unequal for the 2 syllable category ($p<0.01$), 3 syllable category ($p<0.001$), 4 syllable category ($p<0.01$) and 5 syllable category ($p<0.01$). The scores were transformed to reduce their skewness. All four syllable category variables were negatively skewed and therefore subjected to reflect and square root transformations. A multivariate analysis of variance (MANOVA) was used with group as the independent variable and the four syllable categories as the dependent variables, in which verbal IQ and full scale IQ served as the covariates. Where multivariate analysis was significant, univariate analysis of variance (ANOVAs) – one for each syllable category – using verbal IQ and full scale IQ as the covariates were conducted across the three groups. Significant group effects were further explored with a post hoc Student Newman Keuls test to describe group differences (with p set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

Table 3.1.5b Description of the syllable data on the ANrep across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
2 syllables	Direction	Normal	Moderate negative	Normal
3 syllables	Direction	Normal	Substantial negative	Normal
4 syllables	Direction	Moderate positive	Moderate negative	Normal
5 syllables	Direction	Moderate positive	Moderate negative	Moderate negative

The MANOVA revealed a significant main effect of group for syllable category ($F(8, 88) = 9.3; p < 0.001$). Figure 3.1.5 compares the performance of the three groups across the syllable categories.

Figure 3.1.5 Comparison of raw mean scores across the syllable categories of the Adult test of nonword repetition (Anrep) across the three groups



2 syllables

Out of a possible total of 7, the DLD group had the lowest mean score of 4.4 (S.D. 1.6) and the IQ match group the highest of 6.1 (S.D.1.0) with the siblings slightly lower at 5.9 (S.D. 1.1). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

3 syllables

Out of a possible total of 7, the DLD group gained the lowest mean score of 3.3 (S.D. 2.1) and the IQ match group the highest at 6.5 (S.D. .80) with the siblings slightly lower at 6.3 (S.D. .70). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant group effect ($F(2, 45) = 17.7; p < 0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

4 syllables

Out of a possible total score of 7, the DLD group had the lowest mean score of 2.9 (S.D. 1.6) and the IQ match group the highest at 6.2 (S.D. 1.1) with the siblings slightly lower at 6.1 (S.D. 1.0). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant group effect ($F(2, 45) = 18.1; p < 0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

5 syllables

Out of a possible total score of 7, the DLD group had the lowest mean score of 1.0 (S.D. 1.1) and the siblings the highest at 5.0 (S.D. 2.0) with the IQ match group slightly lower at 4.8 (S.D. 1.7). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant group effect ($F(2, 45) = 13.5; p < 0.001$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

PHONOLOGICAL PROCESSING: THE EFFECT OF ARTICULATORY COMPLEXITY

Statistical analysis

Table 3.1.5c compares the performance of the three groups across the simple and complex nonwords categories. Table 3.1.5d is a description of the articulatory complexity data for each of the three groups. The Levene test for homogeneity of variance revealed that the variances across the three groups were unequal for the simple ($p < 0.01$) and complex categories ($p < 0.01$). The scores were negatively skewed and transformed using reflect and square root transformations.

Table 3.1.5c Comparison of ANrep raw scores on the simple and complex articulation categories

		DLD group (n=17)	Sibling group (n=16)	IQ match group (n=17)	Significance test	Post hoc analysis
Simple	Mean (S.D)	6.0 (.80)	11.5 (.30)	11.8 (.43)	p<0.001	DLD<Siblings, IQ
Complex	Mean (S.D)	5.5 (.63)	11.6 (.50)	11.8 (.40)	p<0.001	DLD<Siblings, IQ

Table 3.1.5d Description of the nonword complexity data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
Simple	Direction	Normal	Moderate negative	Normal
Complex	Direction	Normal	Moderate negative	Normal

Univariate analysis of variance (ANOVA) in which verbal IQ and full scale IQ served as the covariates were performed for each category. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with *p* set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group. A t test was used to compare performance on the simple category against the complex category for each of the three groups.

Simple nonwords

Out of a possible total score of 14, the DLD group gained the lowest mean score of 6.0 (S.D .78) and the IQ match group the highest mean score of 11.8 (S.D. .43) with the siblings slightly lower at 11.5 (S.D. .30). A univariate analysis of variance with verbal IQ and FSIQ as the covariates revealed a significant effect ($F(2, 45) = 17.4$; $p<0.001$). The post hoc SNK test found a significant difference between (a) the DLD

group and the sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

Complex nonwords

Out of a possible total score of 14, the DLD group had the lowest mean score of 5.5, (S.D. .63) and the IQ match group the highest at 11.8 (S.D. .39) with the sibling group slightly lower at 11.6 (S.D. .48). A univariate analysis of variance with verbal IQ and FSIQ as the covariates revealed a significant effect ($F(2, 45) = 25.6; p < 0.001$). The post hoc SNK test found a significant difference between (a) the DLD group and the sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

The comparison of the performance for each group (DLD group, Sibling group and IQ match group) between the simple category and the complex category using *t* tests revealed non significant differences.

SENTENCE REPETITION

Statistical analysis

The Levene test for homogeneity of variance revealed that the variances of the three groups were equal for the Sentence Repetition test. The Sentence Repetition scores were not skewed and therefore transformation was not necessary. A univariate analysis of variance (ANOVA) in which verbal IQ and full scale IQ served as the covariates was conducted. A significant effect was further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with *p* set at 0.02 to adjust for multiple comparisons). The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

From a possible total score of 14, the DLD group gained the lowest mean score of 6.7 (S.D. 1.8) compared to the similar higher mean scores of the sibling group (mean = 12.0, S.D. 2.5) and the IQ match group (mean = 12.3, S.D. 1.6). A univariate analysis of variance with verbal IQ and FSIQ as the covariates revealed a significant effect ($F(2, 45) = 19.6; p < 0.001$). The post hoc SNK test found a significant difference between (a) the DLD group and the sibling group ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.001$).

SUMMARY OF FINDINGS

1. The phonological processing abilities as measured by the ANrep of the DLD group were severely impaired relative to both the comparison groups.
2. The performance of the DLD group deteriorated significantly as the number of syllables in the nonwords increased from two syllables to five syllables. Therefore, a significant effect of syllable length was identified for the DLD group only.
3. Performance on the simple nonwords against the complex nonwords was not statistically different for any of the three groups. For the DLD group, items containing consonant clusters (complex) were no more difficult than those without (simple). Therefore a significant effect of articulatory complexity was not found in the DLD group.
4. The DLD group had a deficit in verbal short term memory as shown by their significantly lower mean scores on the Sentence repetition test compared to both control groups.
5. Verbal IQ and full scale IQ were covaried in the analysis of phonological processing and sentence repetition and therefore the IQ ability of the DLD group did not affect their performance. The IQ match group had a much superior performance

than the DLD group even though both of these groups were matched on performance IQ.

CONCLUSION

The impaired phonological processing and sentence repetition abilities of the DLD adults support the presence of verbal short term memory deficits in developmental language disorders. The exact nature of this deficit is complex.

The impaired performance of the DLD adults on the Sentence repetition test simply showed that they had difficulty in briefly storing and retrieving auditory information. This became more difficult as the sentences increased in length and syntactic complexity.

The impaired performance of the DLD adults on the test of phonological processing (ANrep) supports Gathercole & Baddeley's hypothesis (1990) that developmental language disorders are characterised by an impaired phonological loop component of working memory which subsequently results in impaired phonological representation. The identification of a significant syllable effect where recall of longer words is more difficult further supports the theory that representation is impaired. The identification of a non significant articulatory effect shows that rehearsal does not play a significant role in the phonological processing ability of the DLD adults and therefore their impaired performance is primarily due to impaired phonological representation.

A phonological processing deficit independent of IQ and specific to the DLD group was identified. The identification of such deficit in conjunction with impaired

language and literacy (sections 3.1.2 and 3.1.3) suggests that impaired phonological processing has a detrimental effect on language and literacy development as supported by Gathercole & Baddeley (1990) and Stothard et al (1998).

3.1.6) SOCIAL COGNITION

Three theory of mind tasks were used to assess the social cognition abilities of the DLD group, sibling group and IQ match group. These were the Eyes task (Baron – Cohen, Jolliffe et al 1997), the Strange Stories Task (Happé 1994) and the Awkward Moments Task (Phillips and Newman 1994). The Strange Stories Task and the Awkward Moments Tasks both have comprehension control questions in addition to theory of mind questions to ensure that the participant understands the social situations which comprise the task. The Eyes Task does not include comprehension control questions. The results and analysis of the comprehension control questions for the Strange Stories Task and the Awkward Moments Task are discussed first. This is followed by the analysis of the performance of the three groups on the theory of mind questions.

COMPREHENSION CONTROL QUESTIONS

Statistical analysis

Table 3.1.6a is a description of the comprehension control data for each of the three groups. The Levene test for homogeneity of variance found that the variances of the three groups were unequal for the Strange Stories Task ($p < 0.001$) and the Awkward Moments Task ($p < 0.001$). Both the Strange Stories and Awkward Moments scores were moderately negatively skewed and subjected to reflect and log transformations. Univariate analysis of variance (ANOVA) in which verbal IQ and full scale IQ (FSIQ) served as the covariates were then conducted for each of the tasks. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with p set at 0.02 to adjust for multiple comparisons).

The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

Table 3.1.6a Description of the comprehension control data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
Awkward Moments	Direction	Moderate negative	Substantial negative	Substantial negative
Strange Stories	Direction	Moderate negative	Moderate negative	Moderate negative

Strange Stories Task

Out of a possible total score of 22, the DLD group gained the lowest mean score of 19.5 (S.D. 4.1) and the IQ match group the highest of 21.0 (S.D. 1.5) with the siblings slightly lower at 20.7 (S.D. 1.5). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

Awkward Moments Task

From a possible total score of eight, both the sibling group and the IQ match group had mean scores at the ceiling level. The mean score of the DLD group was slightly lower at 7.5 (S.D. .50). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect.

SUMMARY OF FINDINGS

1. The statistical analysis showed that the DLD group, sibling group and IQ match group performed at a very similar high level on the comprehension control questions for both the Strange Stories Task and the Awkward Moments Task. The DLD group had an intact understanding of the situations in order to pass the comprehension

questions for both the Strange Stories Task and the Awkward Moments Task.

2. Verbal IQ and full scale IQ were used as the covariates and therefore the IQ abilities of the three groups did not affect their performance on the comprehension control questions. The DLD group had the lowest verbal IQ abilities which did not affect their adequate level of performance on the comprehension control questions.

CONCLUSION

The DLD group, sibling group and the IQ match group did not exhibit any difficulties with the comprehension control questions of either the Strange Stories Task or the Awkward Moments Task. These results therefore suggest that all of the groups, including the DLD group understood the social situations presented in the two theory of mind tasks.

The intact ability of the DLD group to understand the social situations raises an important issue regarding their receptive language abilities. The impaired performance of the DLD group on the receptive and expressive languages measures would predict difficulties understanding the verbal information conveyed in the social situations of the Strange Stories Task and the Awkward Moments Task. However, the DLD group did have an unexpected but adequate understanding of the social situations presented. A possible hypothesis is presented. The social situations in the Awkward Moments Task are television advertisements and are therefore visual. The comprehension control questions ask about something which happened in the advertisement and is therefore seen visually – the participant does not have to

understand the language used in order to answer the comprehension question. The participant only has to understand the question.

For example, one clip advertises a credit card. The clip shows two business men in a foreign country buying items from a shop to take home. The first man pays with a credit card whilst delineating all the benefits of this credit card. The second man refuses to accept these benefits and insists on using cash. The second man is made to look a fool and at the end walks away with his purchase.

The comprehension control question is “How did the second man pay for his purchase?”, the answer being cash. The clip visually shows the second man paying with cash, the participant does not have to understand language explaining that cash was used. The correct responses to all of the comprehension control questions of the eight clips rely on the visual context of the situations and not understanding the language used. It is therefore probable that the DLD group were able to utilise the visual context and therefore aid their understanding in order to correctly answer the comprehension control questions.

The comprehension control questions of the Strange Stories rely more on verbal understanding. The social situation is read out to the participant or the participant reads the text himself depending on his literacy ability. The comprehension control question relates directly to the text and therefore the participant must understand the text in order to correctly answer the question. The performance of the DLD group was lower than the comparisons but not statistically impaired and therefore the DLD group did verbally understand the text. A possible explanation is that the stories are

simple, without complex language. The stories have been used successfully with young children including eight year olds (Happé 1994). The receptive and expressive language abilities of the DLD group were equivalent to approximately 11 to 12 years (chapter nine). This would predict that they would understand the verbal components of the stories.

In summary, the DLD group were able to understand the social stories presented in the Awkward Moments Task and the Strange Stories Task as assessed by the comprehension control questions.

THEORY OF MIND QUESTIONS

Descriptions and analysis of the theory of mind questions of the Eyes Task, Awkward Moments Task and Strange Stories Task are described and presented here.

Statistical analysis

Table 3.1.6b is a description of the theory of mind data for each of the three groups. The Levene test for homogeneity of variance revealed that the variances of the three groups (DLD group, IQ match group and sibling group) were unequal for the Eyes Task ($p < 0.01$), Awkward Moments Task ($p < 0.01$) and the Strange Stories Task ($p < 0.05$). The three tasks were moderately negatively skewed and therefore subjected to reflect and square root transformations. A multivariate analysis of variance (MANOVA) was used with group as the independent variable and the three theory of mind tasks as the dependent variables, in which verbal IQ and full scale IQ served as the covariates. Where multivariate analysis was significant, univariate ANOVAs – one for each score – using verbal IQ and full scale IQ as the covariates were

conducted across the three groups. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences (with *p* set at 0.02 to adjust for multiple comparisons. The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the IQ match group.

Table 3.1.6b Description of the theory of mind data across the three groups

		DLD group (n=17)	IQ match group (n=17)	Sibling group (n=16)
Eyes task	Direction	Normal	Moderate negative	Normal
Awkward Moments	Direction	Moderate negative	Substantial negative	Substantial negative
Strange Stories	Direction	Moderate negative	Moderate negative	Moderate negative

The MANOVA revealed a significant main effect of group ($F(6, 90) = 6.6; p < 0.001$). Table 3.1.6c displays the theory of mind performance of the three groups.

Table 3.1.6c Comparison of performance on the theory of mind questions

		DLD group (n=17)	Siblings (n=16)	IQ match (n=17)	Significance test	Post hoc analysis
Eyes task	Mean (S.D)	16.6 (3.3)	18.3 (2.7)	19.4 (2.3)	$p < 0.01$	ns
Awkward Moments	Mean (S.D)	4.5 (1.5)	6.8 (2.0)	6.8 (1.0)	$p < 0.01$	DLD < Siblings, IQ
Strange Stories	Mean (S.D)	16.2 (4.7)	20.3 (1.5)	21.0 (2.0)	$p < 0.01$	DLD < Siblings, IQ

Eyes Task

The total possible score on the Eyes Task was 25. The highest mean score was gained by the IQ match group at 19.4 (S.D. 2.3) and the lowest by the DLD group at 16.6 (S.D. 3.3) with the mean score of the sibling group at 18.3 (S.D. 2.7) falling between the DLD group and the IQ match group. A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a non significant effect for the Eyes Task.

Awkward Moments Task

From a maximum score of 8, the DLD group had the lowest mean score of 4.5 (S.D. 1.5). Both the sibling group (mean = 6.8, S.D. .20) and the IQ match group (mean = 6.8, S.D. 1.0) had the same higher mean score. A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant effect ($F(2, 45) = 4.5$; $p < 0.02$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.01$).

Strange Stories Task

Out of a possible total score of 22, the DLD group had the lowest mean score of 16.2 (S.D. 4.7). The IQ match group gained the highest mean score of 21.0 (S.D. 2.0) with the siblings slightly lower at 20.3 (S.D. 1.5). A univariate analysis of variance with verbal IQ and FSIQ as covariates revealed a significant effect ($F(2, 45) = 4.5$; $p < 0.02$). The post hoc SNK test identified a significant difference between (a) the DLD group and the siblings ($p < 0.001$) and (b) the DLD group and the IQ match group ($p < 0.01$).

Strange Stories Task – mental and physical state justifications

The theory of mind justification answers were further analysed to compare mental and physical state justifications (Happé 1994). Mental state answers included all those that referred to thoughts, feelings, desires, traits and dispositions. Mental state justifications included terms such as like, want, happy, cross, afraid, know, think, joke and expecting. Justifications were scored as physical state when they referred to nonmental events, i.e physical appearance, action of objects, physical events and

outcomes. Physical state answers included terms such as big, looks like, to sell them, because of the X (object) and to not get X (physical outcome). Tale 3.1.6ci shows the correct and incorrect mental and physical state justification scores given by the three groups.

Table 3.1.6d Comparison of mental and physical state justifications on the Strange Stories task

Theory of mind answers Overall score	Mean (S.D)	16.2 (4.7)	20.3 (1.5)	21.0 (2.0)
Correct Justifications Mental	Mean (S.D)	11.3 (4.4)	17.2 (2.3)	15.1 (4.4)
Physical	Mean (S.D)	4.4 (2.2)	3.1 (.89)	5.5 (4.2)
Incorrect Justifications Mental	Mean (S.D)	1.9 (1.7)	1.0 (1.1)	.64 (1.5)
Physical	Mean (S.D)	4.0 (3.7)	.69 (.94)	.64 (.79)

One way ANOVAs identified significant effects for correct mental state justifications ($F(2, 47) = 9.5$; $p < 0.001$) and incorrect physical state justifications ($F(2, 47) = 12.1$; $p < 0.001$). Specific comparisons using SNK revealed that the DLD group gave significantly less correct mental state justifications than the siblings ($p < 0.05$) and the IQ match group ($p < 0.01$) and significantly more incorrect physical state justifications than both the comparison groups ($p < 0.001$). The number of correct physical state justifications did not differ significantly across the three groups. Although the DLD group gave significantly less correct mental state justifications, their errors were primarily accounted for by incorrect physical state justifications rather than correct physical state or incorrect mental state justifications. Incorrect physical state justifications include answers that are factually incorrect about physical aspects of the

stories and answers that refer inappropriately to physical events where mental events are the appropriate focus for the justification.

RELATIONSHIPS BETWEEN THE THEORY OF MIND TASKS WITHIN THE DLD GROUP, SIBLINGS AND IQ MATCH GROUP

Pearson product moment correlation was used to examine the relationship between the Eyes Task, Strange Stories Task and the Awkward Moments Task within the DLD adults, siblings and IQ match group. The results are given in tables 3.1.6d, 3.1.6e and 3.1.6f.

DLD adults

For the DLD adults, the Eyes Task was significantly correlated with the Strange Stories Task ($r = .63$; $p < 0.01$) but not the Awkward Moments Task ($r = .29$; ns). The Strange Stories Task was significantly correlated with both the Eyes Task ($r = .63$; $p < 0.01$) and the Awkward Moments Task ($r = .50$; $p < 0.01$).

Siblings

For the siblings, no significant correlations were identified between the three theory of mind tasks. Interestingly, there was a negative non significant relationship between the Eyes Task and (1) the Strange Stories Task ($r = -.24$; ns) and (2) the Awkward Moments Task ($r = -.30$; ns).

IQ match group

For the IQ match group, there was a significant negative correlation between the Strange Stories Task and the Awkward Moments Task ($r = -.55$; $p < 0.05$). In addition,

a negative non significant relationship was identified between the Eyes Task and the Strange Stories Task ($r = -.40$; ns).

Table 3.1.6e Correlations between the Eyes task, Strange stories task and Awkward moments task in the DLD adults (n=17)

Theory of mind task	Eyes Task	Strange Stories Task	Awkward Moments Task
	r	r	r
Eyes Task	1.0		
Strange Stories	.63**	1.0	
Awkward Moments	.29	.50*	1.0

Table 3.1.6f Correlations between the Eyes task, Strange stories task and Awkward moments task in the Siblings (n=16)

Theory of mind task	Eyes Task	Strange Stories Task	Awkward Moments Task
	r	r	r
Eyes Task	1.0		
Strange Stories	-.24	1.0	
Awkward Moments	-.30	.35	1.0

Table 3.1.6g Correlations between the Eyes task, Strange stories task and Awkward moments task in the IQ Match (n=17)

Theory of mind task	Eyes Task	Strange Stories Task	Awkward Moments Task
	r	r	r
Eyes Task	1.0		
Strange Stories	-.40	1.0	
Awkward Moments	.20	-.55*	1.0

* p<0.05, **p<0.01, ***p<0.001

SUMMARY OF FINDINGS

The DLD group gained the lowest mean scores across all of the three theory of mind tasks compared to both the comparison groups.

1. The statistical analysis showed a non significant effect for the Eyes task. The DLD group gained the lowest mean score but this was not significantly lower than either of the comparison groups.
2. A significant effect was identified for the Awkward Moments Task and the Strange Stories Task with the DLD group gaining significantly lower scores than both the comparison groups.
3. Analysis of the theory of mind justification answers on the Strange Stories Task showed that the DLD group gave significantly less correct mental state justifications than both the comparisons. Giving further confirmation of a theory of mind deficit and highlighting their difficulty in attributing mental states. Rather than defaulting to correct physical state justifications or incorrect mental state justifications, the DLD group gave incorrect physical state justifications instead.
4. Verbal IQ and full scale IQ were used as the covariates for the analysis, indicating that their impaired performance on the theory of mind tasks was independent of IQ.
5. The Eyes Task, Strange Stories Task and Awkward Moments Task did not significantly correlate with one another across the DLD adults, siblings and IQ match group.
6. Interestingly, the theory of mind tasks correlated more in the DLD adults than in the siblings and IQ match group. Furthermore, negative correlations between the theory of mind tasks were found in the siblings and the IQ match group which question whether the tasks are all measuring the same cognitive ability or abilities.

CONCLUSION

The DLD group showed a significantly impaired performance on two of the theory of mind tasks (Awkward Moments and Strange Stories) but not the Eyes Task. The analysis of the performance of the three groups across the three theory of mind tasks revealed a discrepancy. A non significant effect was found on the Eyes task compared to significant effects for the Strange Stories Task and the Awkward Moments Task. Although the group differences fell short of statistical significance on the Eyes Task, the DLD adults did have a lower performance across all three theory of mind tasks. However, the superior performance of the DLD group on the Eyes Task may suggest that this task does not measure the same cognitive ability or abilities as the other two theory of mind tasks.

The tasks aim to be second order theory of mind tasks. Such tasks involve the participant reasoning about what one person thinks about another person's thoughts. The Strange Stories and Awkward Moments Tasks definitely meet this criterion but it is arguable that the Eyes Task does not. The nature of the Eyes Task is more of emotion recognition than theory of mind as the participant has to guess what a person is thinking or feeling by looking at their eyes. It is not necessary to take the perspective of the person in the picture in order to identify the emotion from their eyes.

A particularly important finding was the intact performance of the DLD adults on the comprehension control questions of both the Strange Stories Task and the Awkward Moments Task but not the theory of mind questions. This lends substantial support to theory of mind deficits in the DLD group as assessed by the Strange Stories Task and

the Awkward Moments Task. The DLD group had adequate receptive language skills to understand the social situations of the tasks but not to infer information or empathise with the characters.

Performance on the Strange Stories task identified a theory of mind deficit in the DLD group. Further analysis of the mental and physical state justifications revealed that the DLD group gave significantly more incorrect physical state justifications. Only one subject in each of the comparison groups gave an incorrect physical state justification whereas the DLD group gave significantly more. This is difficult to interpret. It may reflect a general inability to understand the story, yet the DLD group passed the comprehension questions implying they were able to understand the physical components. Alternatively, it could result from an element of confusion, where the subject is unable to attribute a mental state but knows a physical state explanation is not an appropriate answer. Therefore, the subject tries unsuccessfully to manipulate a physical state justification into a mental state explanation.

The identification of intercorrelations among the theory of mind tasks in the DLD adults and not the comparisons was especially interesting. Logically, theory of mind tasks should correlate as they are supposedly measuring the same cognitive ability. The lack of correlation among the theory of mind tasks in the comparisons could be due to the tasks not measuring the same cognitive ability, i.e. the ability to infer other peoples' thoughts, beliefs, desires and intentions. Such a cognitive ability is theoretically dependent on many cognitive skills such as listening, concentration, memory, language and intelligence. The different tasks do not systematically control

for the effects of these abilities. Therefore, it is possible that subtle variations exist in these abilities in the comparisons which cause to the lack of intercorrelations.

Why theory of mind correlations occurred in the DLD adults and not the comparisons is unclear. A possible explanation is that there is a definite theory of mind deficit or some cognitive deficit or deficits in the DLD adults which all three tasks were able to tap into. The DLD adults do have a generally lower level of intelligence than the comparisons combined with specific memory deficits and severe receptive and expressive language deficits. The effects of such impairments on theory of mind have not yet been fully examined but it would make sense that these consistently contributed to a generally poorer performance independent of a distinct theory of mind ability. It could be argued that the DLD adults do have a deficit in theory of mind ability (as shown by their intact performance on the comprehension control questions) and that this was further compounded by their overall impairments in memory, language and intelligence.

Theory of mind in normative and other clinical populations has not been explored sufficiently in order to standardise theory of mind tasks and to determine levels of normative and disordered theory of mind ability. The lack of correlation between the theory of mind tasks in the comparison groups suggests that the tasks are not measuring the same cognitive abilities. This could be a result of the effects of other unknown abilities, variations in normative theory of mind performance or the nature of the theory of mind deficit itself.

To conclude, the DLD adults had specific deficits in theory of mind, shown by an intact performance on the comprehension questions, but an impaired performance on the theory of mind questions of two of the second order theory of mind tasks. However, the performance of the comparison and the lack of intercorrelations between the theory of mind tasks in the comparisons questions the validity of the tasks and the exact nature of theory of mind.

3.1.7) ASSOCIATIONS WITHIN THE COGNITIVE PROFILE OF THE DLD ADULTS

The cognitive analysis of the DLD adults across intelligence, language, literacy, phonological processing and social cognition revealed many significant impairments in comparison to the sibling and IQ match comparison groups. The cognitive profile of the DLD adults was analysed further to identify possible relationships between language, literacy, phonological processing and social cognition. Intelligence (IQ) was not included because performance IQ was well within the normal range and therefore not identified as a cognitive deficit. Verbal IQ was also not included in the analysis because of its intrinsic relationship with the impaired language abilities of the DLD adults. However, the effects of performance IQ were controlled for to ensure that the cognitive deficits of the DLD adults were not related simply because of intelligence.

One measure from each cognitive domain was used in the analysis. The British Picture Vocabulary Scales (BPVS) (Dunn et al 1982) provided the language measure and the reading comprehension subtest of the Wechsler Objective Reading Dimensions (WORD) (Wechsler 1993) was chosen as the literacy measure. The Adult Test of Nonword Repetition (ANrep) (Gathercole 1995) was used as the phonological processing measure and social cognition was represented by the Awkward Moments Task (Phillips & Newman 1997). The results of the analysis across the cognitive domains are presented and discussed here.

STATISTICAL ANALYSIS

Partial correlations controlling for the effects of performance IQ (PIQ) were used to examine the relationships between language, literacy, phonological processing and social cognition in the DLD adults. A correlation matrix was calculated which revealed significant relationships between the measures. This correlation matrix is presented in the table 3.1.7.

Table 3.1.7 Partial correlations between the cognitive abilities of the DLD adults (n=17)

Cognitive Measure	Language	Literacy	Phonological processing	Social Cognition
Language BPVS	1.0			
Literacy Reading comprehension subtest (WORD)	.70**	1.0		
Phonological processing ANrep	.60*	.60*	1.0	
Social cognition Awkward moments task	.60*	.67*	ns	1.0

p<0.05, **p<0.01, ***p<0.001

Receptive language was significantly related to literacy (r = .70; p<0.01), phonological processing (r = .60; p<0.05) and social cognition (r = .60; p<0.05). Literacy was significantly related to receptive language (r =.70; p<0.01), phonological processing (r =.67; p<0.05) and social cognition (r = .67; p<0.05). Phonological processing was significantly related to receptive language (r = .60; p<0.05) and literacy (r =.67; p<0.05) but not social cognition. Social cognition was significantly related to receptive language (r =.60; p<0.05) and literacy (r = .60; p<0.05) but not phonological processing.

SUMMARY OF FINDINGS

1. Significant relationships were identified between language, literacy, phonological processing and social cognition when the effects of performance IQ were controlled for. The only non significant relationship was found between social cognition and phonological processing.
2. All the significant associations identified between the cognitive variables were independent of level of performance intelligence.
3. The strongest association was found between language and literacy. The nature of this relationship is unclear but suggests that the initial language disorder impacts on the development of literacy ability.
4. The association between literacy and phonological processing is interesting. It implies that phonological processing plays a role in literacy development. Phonological processing may affect the phonological skills needed in reading development (Snowling et al 2000) or phonological processing directly affects language development which then compromises literacy development.
5. The identified association between language and phonological processing supports the hypothesised link between phonological processing and language development (Gathercole & Baddeley 1990). Adequate receptive language development is dependent on phonological processing to establish long term representations of new words. The association between impaired phonological processing and poor language in the DLD adults proposes that the phonological processing impairment is both a causal and persisting deficit.
6. Interestingly, language and social cognition were significantly related and therefore for the DLD adults, performance on the assessments of social cognition was associated with their level of language ability.

7. The non significant relationship identified between social cognition and phonological processing proposes that these are separate and independent cognitive mechanisms. This suggests that both these impairments are intrinsic deficits in developmental language disorders. However, language was significantly associated with both phonological processing and social cognition. Therefore, it is hypothesised that impaired phonological processing has a direct causal relationship to impaired language development. The relationship between impaired language and impaired performance on social cognition tasks is less clear but suggests that language may be intrinsically involved in the development of social cognition.

CONCLUSION

The correlation analysis identified significant relationships between the cognitive deficits identified in the DLD cohort with the exception of social cognition and phonological processing. These significant relationships were independent of intelligence. Interestingly, phonological processing and social cognition were identified as independent deficits but both symptomatic of developmental language disorders. The implications of this analysis are discussed further within a wider context in chapter 4.

SECTION 3.2: SOCIAL ADAPTATION RESULTS

This section presents the findings from the current study in describing adult social adaptation within employment, independence, relationships, family life and receipt of benefits and housing tenure in male adults with a childhood diagnosis of developmental language disorders (DLD).

The DLD group is compared against two comparison groups, a non language disordered sibling group and a cohort matched on childhood performance IQ and social class from the National Child Development Study (NCDS). A non language disordered sibling group was used in order to determine whether the difficulties of the DLD group are attributable to their initial diagnosis of a developmental language disorder or to their family background.

A cohort matched on childhood performance IQ and social class from the National Child Development Study (NCDS) was also used to determine whether the difficulties of the DLD group are a result of a generally lower performance IQ or attributable to their initial diagnosis of a developmental language disorder.

This section is divided into the following six sub sections. The *first* sub section examines the educational provision received by the DLD group and the sibling group from 5 years to 16 years. The *second* explores employment histories. The *third* determines independent and non independent living status. The fourth investigates relationship histories and the fifth family life. Finally, the sixth sub section examines receipt of welfare benefits and the type of housing tenure.

3.2.1) EDUCATIONAL PROVISION AND ACADEMIC OUTCOME

The subject and informant versions of the Socio-emotional Functioning Interview (Rutter, Le Couteur, Lord et al 1988) were used to ascertain information about the type of educational provision received and the academic outcome of the DLD group and sibling group.

Statistical analysis

A Fisher exact test was used to describe group differences. The following comparisons were made: DLD group versus the Sibling group and (b) DLD group versus the NCDS cohort.

Educational provision

Figures 3.2.1a and 3.2.1b show the type of education provided for the DLD group and sibling group until 16 years of age. Since the DLD boys were recruited from special schools, they remained in specialist educational provision up to the age of 9 years. From 5 to 9 years, the majority of the DLD boys (12, 70.1%) were in residential schools for children with speech and language impairments. The remainder were distributed within language units attached to a junior school ($n = 2$), moderate learning difficulties schools (MLD) ($n = 2$) and mixed handicap schools ($n = 1$). As none of the siblings ever had any developmental problems, they were all in mainstream provision. The Fisher exact test identified that a significantly higher proportion of the DLD boys than the siblings were in specialist educational provision from 5 to 9 years ($\chi^2 = 22.88$, $p < 0.001$).

This pattern of provision for the DLD group changed after the age of 9 years. The siblings all continued into mainstream education and 11 (64.7%) of the 17 DLD boys transferred into mainstream education with very little, if any specialist educational provision. The remaining 6 (35.3%) DLD boys continued into special educational provision but not specifically for speech and language disorders; 3 (11.7%) remained in language units attached to secondary school, 1 remained in a specialist school for speech and language disorders and 2 remained in MLD schools. All the siblings were in mainstream secondary and comprehensive schools. The Fisher exact test identified a non significant difference between the DLD group and sibling group on receipt of specialist educational provision from 9 to 16 years.

Academic outcome

Only one DLD adult (5.8%) had passed a CSE level examination, the remaining 16 (94.1%) DLD adults had never passed an exam at CSE level or above. In contrast, 10 (62.5%) siblings had gained 5 or more O level examinations and 2 CSE examinations, 4 (25%) siblings had never passed an exam. The Fisher exact test identified that a significantly higher proportion of the siblings than the DLD group had gained 5 or more O level passes ($\chi^2 = 15.24$; $p < 0.001$).

Further education

Figure 3.2.1c compares the type of higher education entered by the DLD group and sibling group. After the age of 16 years, a good proportion (9, 52.9%) of the DLD group went onto some type of further education. Five participants (29.4%) went to college to complete technical type courses and 1 participant started an apprenticeship and went onto become a joiner.

Figure 3.2.1a Comparison of educational provision received by the DLD cohort and siblings till 9 years of age

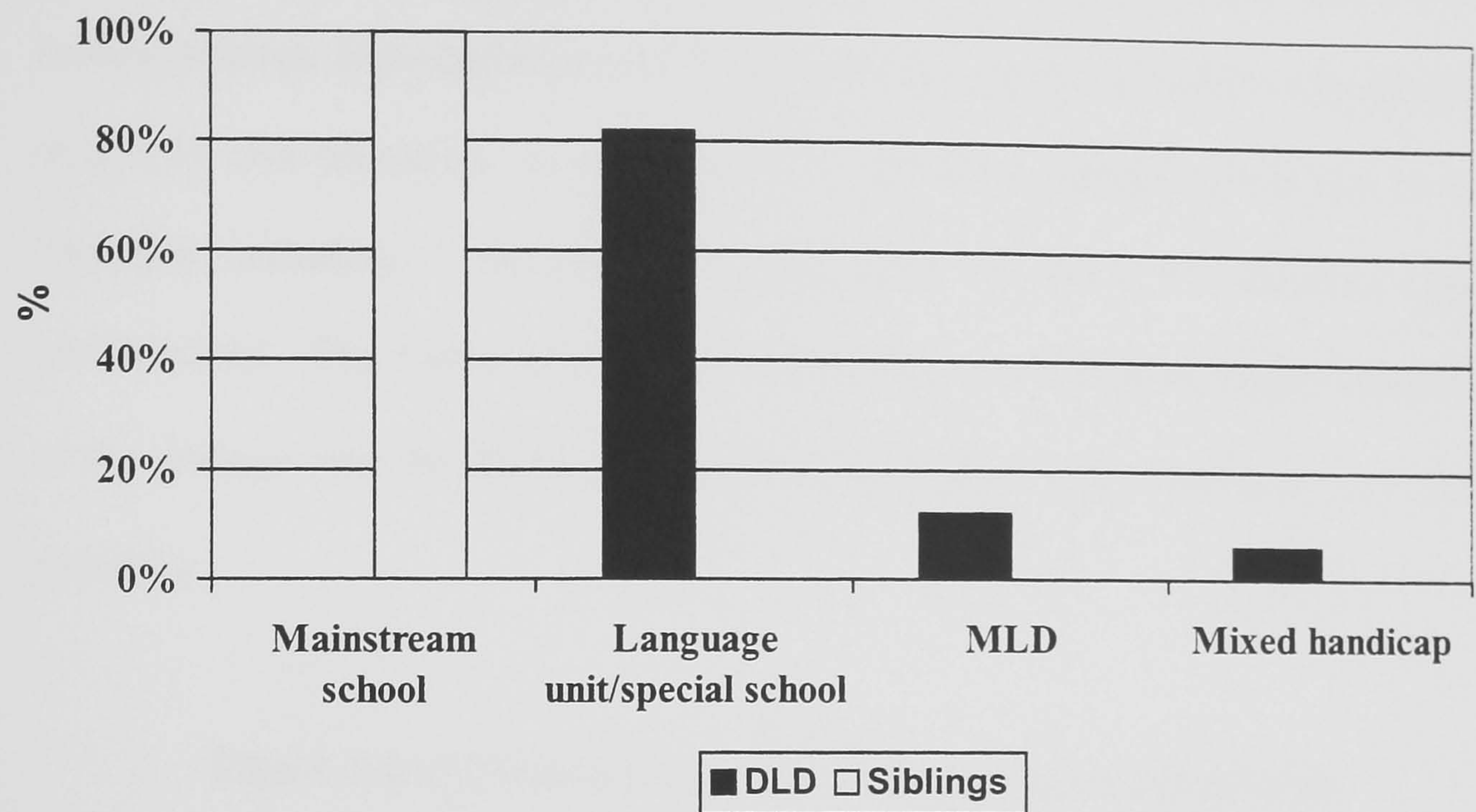
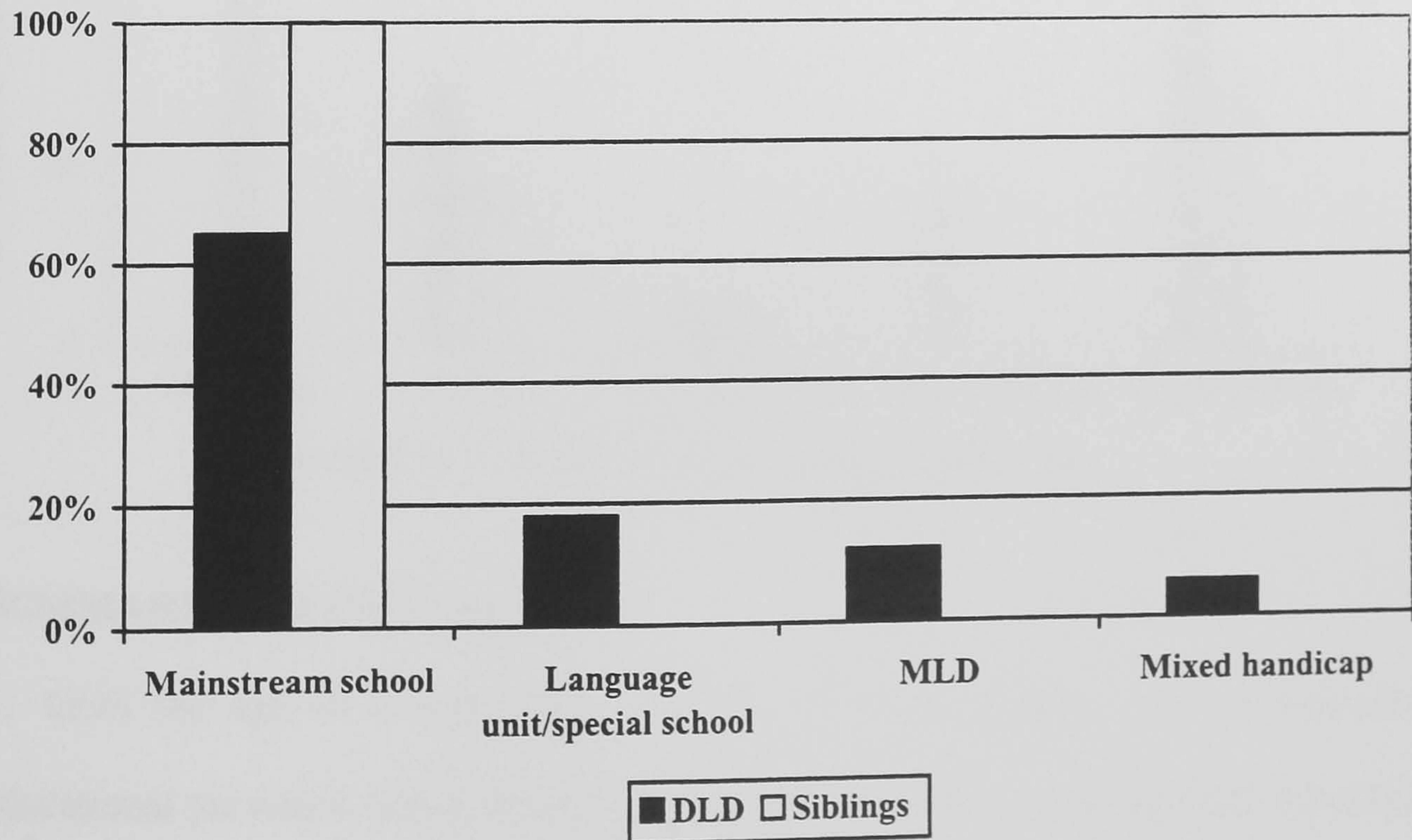
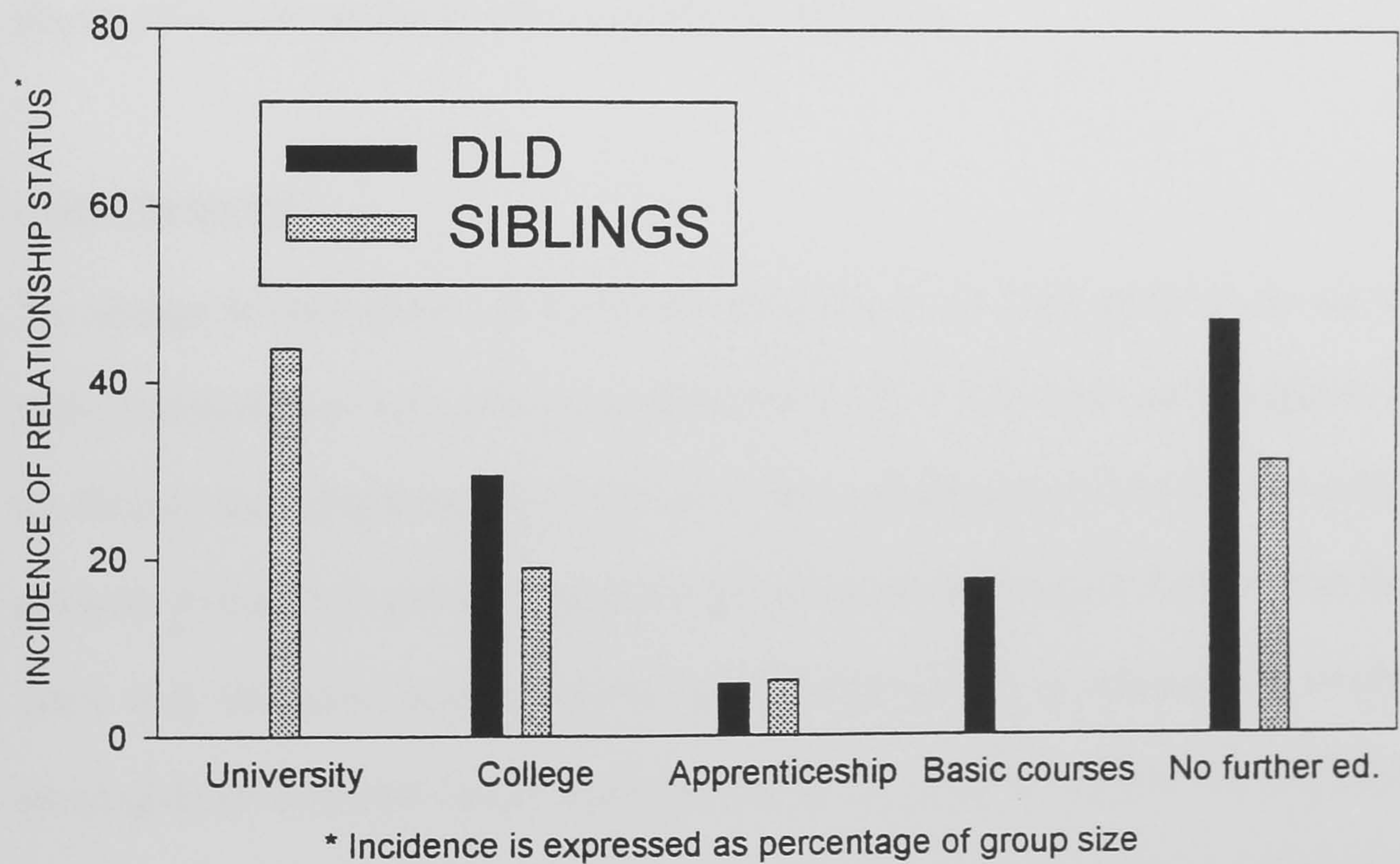


Figure 3.2.1b Comparison of educational provision received by the DLD cohort and siblings from 9 years to 16 years



3 (17.6%) members of the DLD group have done and were currently involved in various basic courses designed to help adults with learning disabilities such as basic reading courses. Eight members (47.1%) of the DLD group did not go onto any form of post 16 year education. In comparison, 11 (68.75%) siblings entered post 16 year education including 7 (43.8%) that went onto university to complete degree qualifications. The Fisher exact test identified that a significantly higher proportion of the siblings than the DLD group entered university or polytechnics ($\chi^2 = 9.44$; $p < 0.001$).

Figure 3.2.1c Comparison of type of higher education entered



SUMMARY OF FINDINGS

1. Until the age of 9 years, the majority of the DLD group were in specialist educational provision aimed to cater for children with speech and language disorders. However, even at this time provision was mixed with three members of the DLD group in schools for moderate learning disabilities and mental and physical handicaps.

However, even at this time provision was mixed with three members of the DLD group in schools for moderate learning disabilities and mental and physical handicaps.

2. All of the siblings were in mainstream education till the age of 16 years. None of the siblings were ever placed in specialist educational provision.

3. At the age of 9 years, there was a change in the educational provision of the DLD group. Over 50% of the DLD group transferred from specialist educational provision into mainstream education with very little, if any specialist support.

4. The academic outcome of the DLD group was poor. Only one of the DLD adults had passed an exam at CSE level or above.

5. The academic outcome of the sibling group was superior to the DLD group with almost 50% of the siblings completing higher education.

CONCLUSION

The change in the pattern of educational provision of the DLD group at the age of 9 years in conjunction with the poor academic outcome of the DLD group suggests that the lack of specialist educational provision had a detrimental effect on the academic potential of the DLD group. Again, the mixed nature of provision from 9 years to 16 years with the same three members of the DLD adults in schools for moderate learning disabilities and mixed handicaps raises the issue of whether the DLD group received the most suitable type of provision considering their childhood diagnosis of developmental language disorders.

3.2.2) EMPLOYMENT

The subject and informant versions of the Socio – emotional Functioning Interview (Rutter, Le Couteur, Lord et al 1988) were used to obtain information pertaining to the employment outcome of the DLD group and sibling group. The outcome of a cohort of boys from the National Child Development Study at age 33 years matched to the DLD group on childhood performance intelligence and social class provided an additional comparison group. Employment outcome was categorised into:

1. Currently unemployed at the time of assessment
2. Employment history: (a) Continual employment, (b) Two or more years unemployment
3. Dismissals from employment.

Statistical analysis

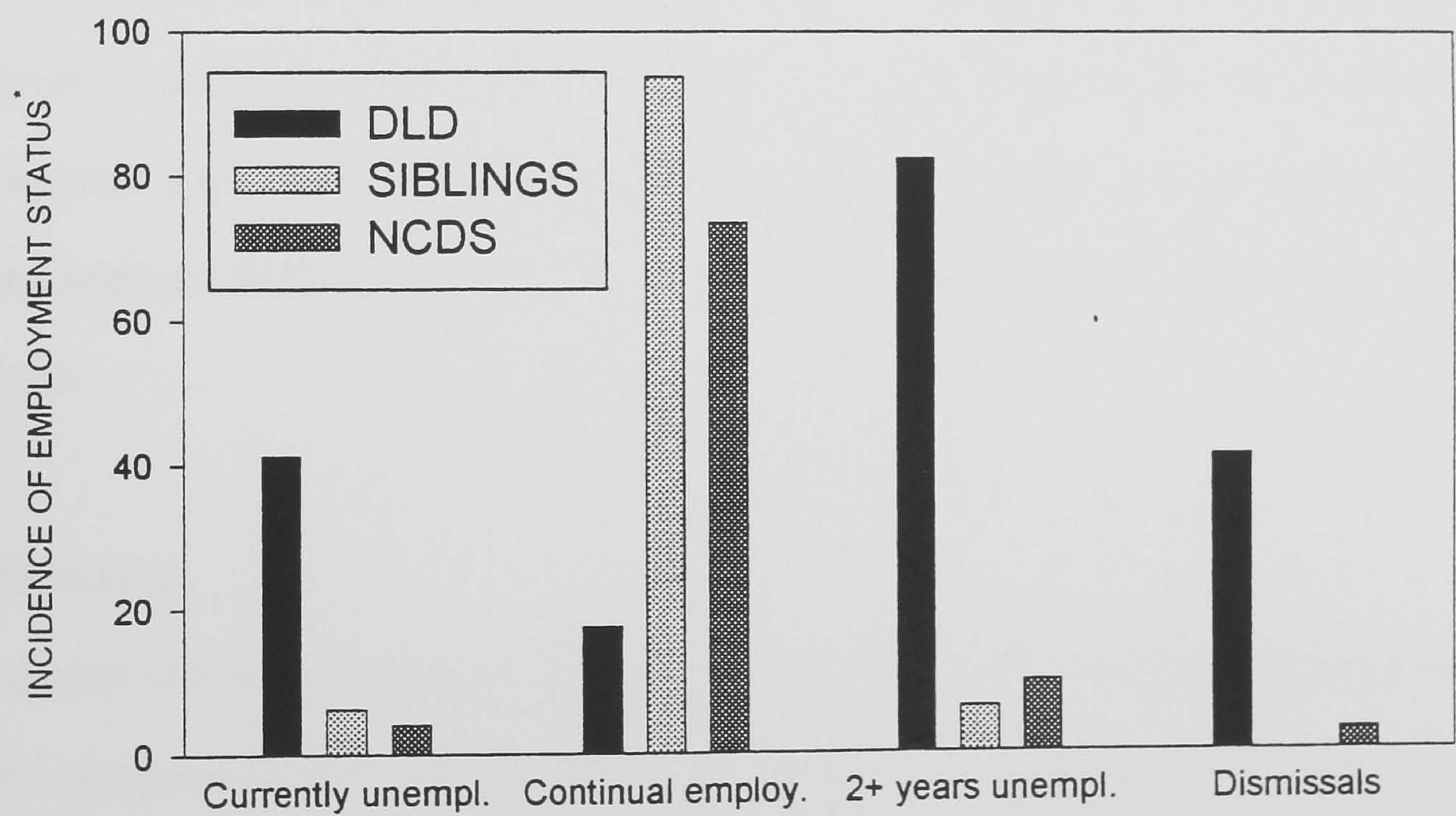
Figure 3.2.2 compares the employment outcome of the DLD group, sibling group and the NCDS cohort. A fisher exact test was performed to describe group differences on the four employment measures. The following comparisons were made (a) DLD group versus sibling group and (b) DLD group versus the NCDS cohort.

Currently unemployed

At the time of assessment, 10 (58.8%) DLD adults were employed and the remaining 7 (41.2%) were unemployed including 4 (24%) who were in voluntary work. The employment of the DLD adults consisted of machine operators, council hygiene and garden workers, kitchen hands and building site workers. None of the DLD group had entered graduate professional positions. In contrast, only 1 sibling and 48 (4.2%) members of the NCDS cohort were unemployed.

The remaining 15 siblings (93.8%) were employed within positions such as accountancy, dentistry, medicine, retail and administration. At the time of assessment, a much higher proportion of the DLD group were unemployed compared to the siblings and the NCDS cohort. The Fisher exact test identified a significant difference between the (a) the DLD group and the siblings ($p<0.05$) and (b) the DLD group and the NCDS cohort ($P<0.001$).

Figure 3.2.2 Comparison of currently unemployed, employment history and dismissals



* Incidence is expressed as percentage of group size

Employment history

(a) Continual employment

A much smaller proportion of the DLD adults (3, 17.6%) had continually been in paid employment within positions of stock controller, council hygiene worker and building site worker compared to 15 (93.8%) siblings and 850 (73.6%) members of the NCDS cohort. The Fisher exact test identified a significant difference between (a) the DLD

group and the siblings ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.001$).

(b) Two or more years unemployed

The employment histories of the groups proved to be more revealing of the difficulties the DLD group had experienced in employment. Fourteen (82.4%) DLD adults had experienced two or more years of unemployment compared to only 1 sibling and 113 (9.8%) members of the NCDS cohort. The Fisher Exact test identified a significant difference between (a) the DLD group and the siblings ($p<0.001$) and (b) the DLD group and the NCDS cohort ($p<0.001$). Interestingly two DLD adults had never been in paid employment. At the time of assessment, these two adults were in voluntary positions arranged by their parents including helping to clean a local church and helping a friend to set up his local market stall. Neither received payment for their work.

Dismissals

Another interesting finding was the higher proportion of the DLD group compared to the comparisons that had experienced problems in the work place leading to their dismissal. Seven (41.2%) DLD adults had been dismissed compared to none of the siblings and 35 (3.03%) members of the NCDS cohort. Two DLD participants had felt unable to cope with their work load and failed to engage with their work colleagues effectively which lead to their own decision to leave. Five (29.4%) of the participants were dismissed due to inappropriate behaviour including swearing at colleagues, setting office papers on fire, fighting and a lack of punctuality. The Fisher Exact test identified a significant difference between (a) the DLD group and the sibling group ($p<0.001$) and (b) the DLD group and the NCDS cohort ($p<0.01$).

SUMMARY OF FINDINGS

1. The employment outcome of the sibling group and the NCDS cohort showed that in adult life, the DLD group had difficulties gaining and maintaining employment.
2. At the time of assessment, a significantly higher proportion of the DLD group than both the comparison groups were unemployed, had experienced multiple periods of unemployment and been dismissed from the work place.
3. A significantly lower proportion of the DLD group than the sibling group and the NCDS cohort had experienced continual employment.
4. The sibling group controlled for family background and therefore the poorer employment outcome of the DLD group compared to the sibling group could not entirely be a result of their family background.
5. The NCDS cohort controlled for childhood performance IQ and social class and therefore the poorer employment outcome of the DLD group compared to the NCDS cohort could not be entirely attributed to lower childhood performance IQ and lower social class.

CONCLUSION

The NCDS cohort validated the good employment outcome of the sibling group and therefore both comparison groups highlighted a major discrepancy between themselves and the DLD group across all four measures of employment outcome. The sibling group shared the same common family background and had a superior employment outcome. The NCDS cohort were matched to the DLD group on childhood performance IQ and social class and had a superior employment outcome to the DLD group. Therefore, the developmental language disorder was identified as a causal factor in the poor employment outcome of the DLD group.

3.2.3) INDEPENDENT LIVING

The subject and informant versions of the Socio –Emotional functioning Interview (Rutter, LeCouteur, Lord et al 1988) were used to obtain information pertaining to the independent living circumstances of the DLD group and sibling group. The outcome of a cohort of boys from the National Child Development Study (NCDS) at age 33 years matched to the DLD group on childhood performance intelligence and social class provided an additional comparison group. Independent living was defined as living away from the parental home with control of all financial and domestic aspects of daily living.

Statistical analysis

Table 3.2.3 compares the independent and non independent living status of the DLD group, sibling group and NCDS cohort. A fisher exact test was used to describe group differences. The following comparisons were made: DLD group versus the Sibling group and (b) DLD group versus the NCDS cohort.

Independent living

Independent living was identified as a particular problem for the DLD group. Only 7 (42.2%) DLD adults were living independently compared to much higher proportions of the siblings (15, 93.7%) and the NCDS cohort (1057, 91.5%). The Fisher exact test identified a significant difference between (a) the DLD group and the siblings ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.001$).

Of those DLD adults not living independently, 5 (29.4%) were still living in the parental home having never lived anywhere else. A further 3 (17.6%) were in

sheltered accommodation which in all three cases was near to the parental home so that parents had regular contact with their sons. One of the DLD participants lived in an independent flat but relied on his parents to help carry out his daily life, for example, his mother did his washing and cooked his meals. The remaining non independent DLD adult had been in residential units and hostels for the mentally ill since his early twenties when he developed mental health problems.

Table 3.2.3 Independent and non independent living circumstances

	DLD group		Siblings		
	N = 7	%	N = 16	%	Fisher exact test
Independent – away from the parental home	7	41.2	15	93.7	7.6**
Not living independently	10	58.8	1	6.25	7.6**
• Independent but relies on parental support	1	5.9	0	0	ns
• Living with parents	5	29.4	1	6.25	ns
• Sheltered flat	3	17.6	0	0	ns
• Residential	1	5.9	0	0	ns
Total	17	100	16	100	

*p<0.05. **p<0.01, ***p<0.001

With the exception of 1 sibling who was still living in the parental home due to being in full time education, all of the siblings had achieved complete autonomous and independent living, the majority living with their own families far away from the parental home.

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• Residential	1	5.9	0	0	ns
Total	17	100	16	100	

*p<0.05. **p<0.01, ***p<0.001

With the exception of 1 sibling who was still living in the parental home due to being in full time education, all of the siblings had achieved complete autonomous and independent living, the majority living with their own families far away from the parental home.

SUMMARY OF FINDINGS

1. The significantly higher proportions of the sibling group and NCDS cohort living independently identified that the DLD group experienced difficulties with independent living.
2. The difficulties in independent living encountered by the DLD group were both financial and domestic in nature. Five members (29.4%) of the DLD group were still in the parental home which for all the parents involved was a cause for concern as the parents were becoming older and therefore more worried for the future of their sons.
3. The sibling group controlled for family background and all but one had achieved complete independent and autonomous living. Therefore, the lack of independent living of the DLD adults compared to the siblings is not entirely due to the family background of the DLD group.
4. The NCDS cohort controlled for childhood performance IQ and social class. The majority of the NCDS cohort (91.5%) had achieved independent living. Therefore, the lack of independent living identified in the DLD group compared to the siblings was not solely a result of lower childhood performance IQ and social class.

CONCLUSION

The lack of independent living in the DLD adults is surprising given that the mean age of the group is 36 years and 2 months. The lack of independent living is in great contrast to both the siblings and the NCDS cohort. This suggests that the difficulties in independent living experienced by the DLD group are a cause of the developmental language disorder rather than a result of family background, social class and a lower childhood performance IQ.

3.2.4) RELATIONSHIPS

The subject and informant versions of the Socio – Emotional Functioning Interview (Rutter, LeCouteur, Lord et al 1988) were used to obtain information pertaining to the relationship status of the DLD group and sibling group. The outcome of a cohort of boys from the National Child Development Study (NCDS) study at age 33 years matched to the DLD group on childhood performance IQ and social class provided an additional comparison group. Relationship status consisted of the following categories:

1. Currently living with a partner
2. Ever lived as married with a partner for a month or more
3. Experience of a partnership breakdown.

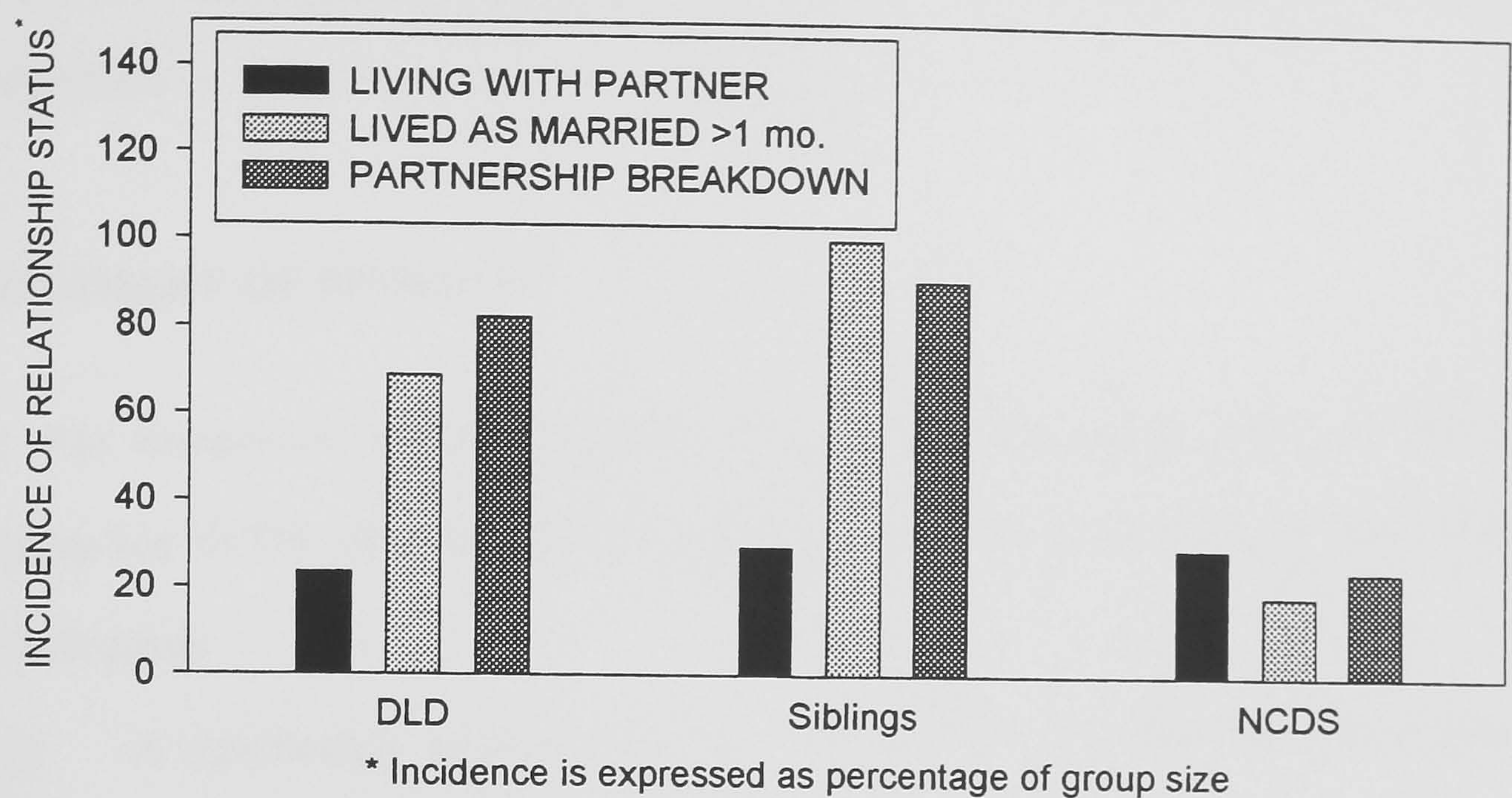
Statistical analysis

Figure 3.2.4 compares the relationship status of the DLD group, sibling group and NCDS cohort. A Fisher exact test was used to describe group differences. The following comparisons were made: DLD group versus the Sibling group and (b) DLD group versus the NCDS cohort.

Currently living with a partner

At the time of assessment, only 4 (23.5%) DLD adults compared to 11 (68.7%) siblings and 948 (82.1%) members of the NCDS cohort were either married or in a committed relationship with a partner. Two DLD adults were married, (one was married for the second time) and the remaining two were in cohabiting relationships. The Fisher exact test identified a significant difference between (a) the DLD group and sibling group ($p < 0.05$) and (b) the DLD group and the NCDS cohort ($p < 0.001$).

Figure 3.2.4 Comparison of relationship status



Lived as married for more than one month

Analysis of the relationship histories revealed that only 5 (29.4%) of the DLD group had ever been in a committed relationship (lived as married for more than one month) compared to all of the siblings (16, 100%) and the majority of the NCDS cohort (1048, 90.8%). The remaining 12 (70.5%) DLD adults had never experienced a committed relationship. The Fisher exact identified a significant difference between (a) the DLD group and sibling group ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.001$).

Experience of a partnership breakdown

As already discussed, 5 (29.4%) DLD adults had experience of committed relationships (lived as married for more than one month). Two of these relationships had broken down resulting in divorce. Informant reports of these breakdowns report in both cases that it was largely the result of the DLD adults finding marriage difficult to cope with. Interestingly, 2 (11.8%) DLD adults and 3 (18.8%) siblings had been

married but were divorced compared to 284 (24.6%) members of the NCDS cohort who had experience of a partnership breakdown. Non significant differences were identified.

SUMMARY OF FINDINGS

1. The comparison of the relationship status of the DLD group against the sibling group and NCDS cohort identified a significant deficit in the relationship status of the DLD group.

- (i) A significantly smaller proportion of the DLD group than the sibling group and the NCDS cohort were currently living with a partner at the time of assessment.
- (ii) A significantly smaller proportion of the DLD group than the sibling group and the NCDS cohort had ever lived as married for more than one month. At the age of 36 years and 2 months, 70.5% of the DLD group had never experienced a committed relationship.
- (iii) There were no significant differences between the proportions of the DLD group, sibling group and NCDS cohort who had ever experienced a partnership breakdown. This is most likely a result of the much smaller proportion of the DLD group who had ever been involved in committed relationships.

2. The sibling group showed a similar superior relationship status to the NCDS cohort. The sibling group controlled for family background and therefore the deficit in the relationship status of the DLD group compared to the siblings could not entirely be a result of the family background of the DLD group.

3. The NCDS cohort controlled for childhood performance IQ and social class and therefore the deficit in the relationship status of the DLD group compared to the NCDS cohort could not entirely be a consequence of lower childhood performance IQ and social class.

CONCLUSION

In adult life, the DLD group had little experience of committed relationships. In comparison to the sibling group and the NCDS cohort, the DLD group had a significant deficit in their relationship status; very few were currently and had ever been in committed relationships. The NCDS cohort was matched to the DLD group on childhood performance IQ and social class and had a superior relationship status to the DLD group. The sibling group shared the same common family background and had a superior relationship status at assessment. This therefore suggests that the initial developmental language disorder played a role on the poor relationship status of the DLD group in adult life.

3.2.5) FAMILY LIFE

The subject and informant versions of the Socio – Emotional Functioning Interview (Rutter, LeCouteur, Lord et al 1988) were used to obtain information pertaining to the family life and circumstances of the DLD group and the sibling group. A cohort of boys from the National Child Development Study (NCDS) at age 33 years matched to the DLD group on childhood performance intelligence and social class provided an additional comparison group. Outcome within family life consisted of:

1. Ever fathered a child
2. Number of children fathered
3. Responsibility taken for own children

In comparison to the siblings and NCDS cohort, the DLD group had poor relationship histories with a significantly smaller proportion of the DLD group having experience of marriage and committed relationships (section 3.2.4). As a result, the family life of the DLD group was very different to the siblings and the NCDS cohort.

Statistical analysis

A Fisher exact test was used to describe group differences. The following comparisons were made: (a) DLD group versus the Sibling group and (b) DLD group versus the NCDS cohort.

Number of children fathered

Figure 3.2.5 compares the family life of the DLD group, Sibling group and NCDS cohort. In their mid thirties, three DLD adults (17.6%) had ever fathered children compared to much higher proportions of the siblings (12, 75%) and NCDS cohort

(799, 69.2%). The Fisher exact test identified a significant difference between (a) the DLD group and the siblings ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.01$).

Table 3.2.5 Comparison of ever fathered a child and responsibility taken for children

Variable	NCDS		DLD		Siblings		Fisher exact test
	N 1155	%	N 17	%	N 16	%	
Ever fathered a child	799	69.2	3	17.6	12	75	DLD<NCDS*** DLD<Siblings**
Responsibility taken for children	799	100	2	66.6	12	75	ns

* $p<0.05$ level, ** $p<0.01$ level, *** $p<0.001$ level

Number of children fathered and responsibility taken for children

One DLD adult had three children, two by his first marriage and the third by his second marriage. He lived with the third child and was in regular contact with his two other children. One DLD adult had two children who he lived with and the remaining DLD adult had one child who he had very irregular contact with. In contrast, more of the siblings (12, 75%) had children with four siblings having three or more children, all of the siblings took responsibility for their children. The Fisher exact test for number of children fathered identified a significant difference between (a) the DLD group and siblings ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.001$). Non significant differences were identified for responsibility taken for children.

SUMMARY OF FINDINGS

1. In comparison to the sibling group and the NCDS cohort, the DLD group had not managed to develop their own family lives.
2. In comparison to the sibling group and the NCDS cohort, the DLD group had fathered significantly fewer children.
3. Two of the three DLD adults who had fathered children took responsibility for their children even though they were not living with them.
4. The sibling group controlled for family background and therefore the lack of family life of the DLD group compared to the siblings could not be solely due to the family background of the DLD group
5. The NCDS cohort controlled for childhood performance IQ and social class. Therefore, the lack of family life of the DLD group compared to the NCDS cohort could not entirely be due to lower childhood performance IQ and social class.

CONCLUSION

The family life of the DLD group was very different to both the sibling group and the NCDS cohort. The lack of heterosexual relationships found in the DLD group was in great contrast to both the sibling group and NCDS cohort. This paucity in relationships was reflected by the limited family life of the DLD group with respect to fathering children. The family life of the NCDS cohort was very similar to that of the sibling group. The sibling group shared the same family background as the DLD group but had more experience of relationships and family life. The NCDS cohort was matched to the DLD group on childhood performance IQ and social class but again had more experience of relationships and family life. Therefore, the developmental language disorder was identified as a causal factor in the difficulties

experienced by the DLD group in establishing relationships and developing their own lives.

3.2.6) RECEIPT OF WELFARE BENEFITS AND HOUSING TENURE

The subject and informant versions of the Socio – Emotional Functioning Interview (Rutter, LeCouteur, Lord et al 1988) were used to obtain information regarding the current housing tenure and receipt of welfare benefits ever by the DLD group and sibling group. The outcome of a cohort of boys from the National Child Development Study (NCDS) at age 33 years matched to the DLD group on childhood performance intelligence and social class was used as an additional comparison group.

This outcome category compared receipt of state benefits reflecting low family income (unemployment benefit, supplementary benefit/income support, family income supplement/family credit, one parent benefit and housing benefit) and housing tenure categories.

Statistical analysis

A fisher exact test was used to describe group differences. The following comparisons were made: (a) DLD group versus the Sibling group and (b) DLD group versus the NCDS cohort.

Current housing tenure

Table 3.2.6 compares the current housing tenure of the DLD group, Sibling group and NCDS cohort. Of the 7 (41.2%) DLD adults living independently all of them were living in accommodation rented from local authorities. None of the DLD group were owner occupiers. In comparison, 10 (62.5%) of the 14 siblings (87.5%) living independently were owner occupiers with the remaining 4 (29%) siblings in local authority accommodation. This was similar to the proportion (866) (75%) of the

NCDS cohort who were in owner occupied property. The Fisher exact test identified a significant difference between (a) the DLD group and sibling group ($p<0.001$) and (b) the DLD group and the NCDS cohort ($p<0.001$).

Table 3.2.6 Comparison of receipt of welfare benefits ever and owner occupiers

Variable	NCDS		DLD		Siblings		Fisher exact test
	N 1155	%	N 17	%	N 16	%	
Receipt of benefits ever	101	8.8	11	64.7	5	31.3	DLD<NCDS*** DLD<Siblings**
Owner occupiers	866	75	0	0	10	62.5	DLD<NCDS, Siblings***

* $p<0.05$ level, ** $p<0.01$ level, *** $p<0.001$ level,

Receipt of welfare benefits

Receipt of welfare benefits reflecting low family income was examined in the three groups. A higher proportion of the DLD group (11,64.7%) had received benefits ever compared to only 1 sibling and 101 (8.8%) members of the NCDS cohort. The Fisher exact test identified a significant difference between (a) the DLD group and siblings ($p<0.01$) and (b) the DLD group and the NCDS cohort ($p<0.001$).

SUMMARY OF FINDINGS

1. A significantly smaller proportion of the DLD group (i.e. none) than the sibling group and the NCDS cohort were owner occupiers.
2. A significantly higher proportion of the DLD group than the sibling group and the NCDS cohort had ever received welfare benefits.

3. The sibling group controlled for family background and therefore the lack of owner occupier housing tenure and higher receipt of welfare benefits of the DLD group were not entirely attributable to their family background.

4. The NCDS cohort controlled for IQ and social class. Therefore the lack of owner occupier housing tenure and higher receipt of welfare benefits of the DLD group were not entirely a consequence of lower performance IQ and social class.

CONCLUSION

Within the outcome variables of receipt of benefits and housing tenure, the DLD group had an impoverished outcome in comparison to the DLD group and sibling group. The higher proportion of the DLD group receiving benefits and not in owner occupier property reflects their difficulties in employment resulting in low incomes and independent living and paucity of family life of the DLD group.

The outcome of the NCDS cohort paralleled that of the sibling group and therefore showed a significant discrepancy between the DLD group and the comparison groups despite controlling for childhood performance intelligence, social class and family background, suggesting that it is the diagnosis of a developmental language disorder which is attributable to the impoverished adult outcome.

SECTION 3.3: PSYCHIATRIC FUNCTIONING

Self report scales and data from the subject and informant versions of the Socio – Emotional Functioning Interview (Rutter, Le Couteur, Lord et al 1988) were used to obtain information regarding the psychiatric history of the DLD group and the siblings. Two self report scales were used to identify any evidence of mental health problems; the Malaise Inventory (Rutter, Tizzard & Whitmore 1979) and the Schizotypal Personality Questionnaire (Raine 1991). Contacts with GPs or specialists over emotional problems over the last ten years were also noted. The outcome of a cohort of boys from the National Child Development Study (NCDS) at age 33 years matched to the DLD group on childhood performance intelligence (IQ) and social class provided an additional comparison group for the Malaise Inventory and contacts with GPs or specialists regarding mental health or emotional problems. Where mental health difficulties were evident, the medical notes of these participants were obtained from the relevant GPs and psychiatrists and examined.

SELF REPORT SCALES

Statistical analysis

The Levene test for homogeneity of variance revealed that the variances of the two groups (DLD group and sibling group) were equal for the Malaise Inventory and the Schizotypal Personality Questionnaire (SPQ). A univariate analysis of variance – one for each scale – was conducted across the two groups. Significant effects were further explored with a post hoc Student Newman Keuls (SNK) test to describe group differences between the DLD group and the Siblings. A cohort from the National Child Development Study (NCDS) matched to the DLD group on childhood

performance IQ and social class provided an additional comparison group for the Malaise Inventory.

Malaise Inventory

Out of a possible total score of 24, the DLD group had a higher mean score of 4.5 (S.D 3.9) than the siblings at 2.7 (S.D 3.0). Table 3.3a compares the scores. A one way analysis of variance identified a non significant effect between the DLD group and the Siblings.

Table 3.3a Comparison of Malaise Inventory scores and contact with GPs/specialists

	DLD group (n = 17)	Siblings (n = 16)	NCDS (n = 1155)
Malaise Inventory (mean total score)	4.5 (S.D 3.9)	2.7 (S.D 3.0)	2.03 (2.70)
Malaise Inventory (6 + items)	4 (23.5%)	1 (6.25%)	95.8 (8.3%)
Contact with GPs/specialists	4 (23.5%)	0 (0%)	151.3 (13.1%)

A total score of six or more on the Malaise Inventory has been shown to indicate possible clinical depression (Rutter, Tizzard, Yule et al 1976). 4 (23.5%) DLD adults scored above a cut point of six compared to 1 (6.2%) sibling and 95.8 (8.3%) of the NCDS cohort. The Fisher exact test identified a significant difference between (a) the DLD group and siblings (p<0.05) and (b) the DLD group and the NCDS cohort.

Schizotypal Personality Questionnaire (SPQ)

Out of a possible total score of 74, the DLD group had a higher mean score of 21.9 (S.D 4.5) than the siblings at 10.6 (S.D 4.2). A one way analysis of variance

identified a significant group effect ($F(2, 45) = 5.1; p < 0.01$). The post hoc SNK test identified a significant difference between the DLD group and the sibling group ($p < 0.02$).

Contacts with GPs or specialists over mental health or emotional problems over the last ten years

4 (23.5%) DLD adults had sought help for mental health problems compared to none of the siblings and 151.3 (13.1%) of the NCDS cohort who sought help for emotional problems only. The Fisher exact test identified a significant difference between (a) the DLD group and Sibling and (b) the DLD group and NCDS cohort.

Analysis of SPQ subscales

The SPQ contains nine subscales for the nine schizotypal traits of schizophrenia: ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual thinking, odd or eccentric behaviour, no close friends, odd speech, constricted affect and suspiciousness. Table 3.3b shows the mean scores obtained by the DLD group and sibling group on the subscales.

The DLD group consistently gained higher mean scores than the Siblings across all of the nine subscales. A one way analysis of variance was performed for each of the nine scales. A significant effect was identified for no close friends ($F(2, 45) = 5.0; p < 0.02$), odd speech ($F(2, 45) = 6.1; p < 0.01$), odd or eccentric behaviour ($f(2, 45) = 5.4; p < 0.01$) and suspiciousness ($F(2, 45) = 5.4; p < 0.01$).

Table 3.3b Comparison of mean scores on the Schizotypal Personality Questionnaire (SPQ)

Mean SPQ subscale scores	DLD (n = 17)	Siblings (n = 16)	ANOVA	SNK
Ideas of reference	1.4 (2.09)	.63 (.80)	ns	ns
Excessive social anxiety	3.4 (2.2)	1.6 (2.0)	ns	ns
Odd beliefs or magical thinking	.93 (1.4)	.50 (.73)	ns	ns
Unusual perceptual experiences	.80 (.94)	.50 (.73)	ns	ns
Odd or eccentric behaviour	1.5 (1.5)	.31 (.60)	p<0.01	ns
No close friends	4.7 (2.2)	2.4 (3.0)	p<0.02	p<0.05
Odd speech	3.8 (3.3)	.63 (.88)	p<0.001	p<0.01
Constricted affect	2.3 (2.0)	.94 (1.2)	ns	ns
Suspiciousness	2.3 (2.0)	.60 (.70)	p<0.01	p<0.01

Raine (1991) assessed the presence of each schizotypal trait on a 3 point scale (1 = absent, 2 = subthreshold, 3 = threshold). Participants had to have five traits out of nine at threshold level for a DSM – III diagnosis of schizotypal personality disorder. The DLD group was at threshold for three out of the nine traits: excessive social anxiety, no close friends and odd speech. In comparison, the siblings did not reach threshold for any of the nine traits.

PSYCHIATRIC HISTORY

At the time of assessment, four DLD adults were experiencing mental health difficulties. Two of these had been identified at the time 3 follow up and had experienced subsequent breakdowns since this time in their twenties. This included one DLD adult who had suffered a schizophreniform illness. He became withdrawn and quiet at the age of 19 years and suffered from hallucinations and delusions. He was hospitalised for 4 months and made a good recovery till his mid twenties when he experienced another episode of illness and was back in hospital. From this time to his mid thirties, he had suffered another episode of illness requiring hospitalisation and

community support. He had not been able to work since he was 19 years old. The other DLD adult had also developed a schizophreniform disorder with delusions at the age of 20 years requiring hospitalisation and subsequently sheltered accommodation where he was still living at the time of assessment.

Since the time 3 follow up, two more DLD adults had experienced mental health problems. One DLD adult had been diagnosed with a major depressive disorder with psychosis in his thirties. The remaining DLD adult (DB) was diagnosed with atypical psychosis in his early thirties. For the last ten years DB's parents and family had found DA very difficult to cope with. He has been placed on remand for domestic violence and attempted suicide on several occasions with admissions to psychiatric wards.

SUMMARY OF FINDINGS

1. The DLD group had higher Malaise scores than the sibling group but this was not statistically significant.
2. A significantly higher proportion of the DLD group scored above the cut point of 6 out of 24 on the Malaise Inventory compared to both the Siblings and NCDS cohort, indicating a higher incidence of depression in the DLD adults.
3. A significantly higher proportion of the DLD group than the Siblings and NCDS cohort had contacted GPs or specialists regarding mental health or emotional problems over the last ten years.
4. On the Schizotypal Personality Questionnaire, the DLD group had a significantly higher total score than the Siblings.

5. The DLD group were at threshold for three out of the nine schizotypal traits. This did not meet the threshold level for a DSM –III –R diagnosis of schizotypal personality disorder. The siblings did not meet threshold for any of the nine traits.
6. The three traits the DLD group met threshold for were more linked to their difficulties in social adaptation than features of schizophrenia.
7. 4 of the 17 DLD adults had experienced mental health problems, 2 had developed schizophrenia, 1 major depression and 1 personality disorder compared to none of the siblings. The incidence of mental health problems had increased further into adult life.

CONCLUSION

Unfortunately, the risk of psychiatric disorder had increased further into adult life with respect to confirmed diagnoses and self reported depressive symptoms and schizotypal traits. None of the siblings had experienced any mental health difficulties.

Psychiatric disorder was specific to these DLD adults independent of family background, social class and intelligence. This proposes that developmental language disorders increase the risk of psychiatric disorder either by a direct cognitive link such as a deficit in phonological processing and/or social cognition or by the difficulties experienced in social adaptation resulting in increased social isolation. Either way, developmental language disorders are a risk factor for mental health problems in adult life.

This finding is supportive of the literature, which has identified a higher prevalence of psychiatric problems in children with current impairments of speech and language

(Stevenson et al 1985, Silva et al 1983) and adolescents with a history of speech and language impairments (King et al 1982). The prevalence is higher in those children and adults where language is involved in the impairment, particularly receptive language (Beitchman et al 1996, Baker & Cantwell 1987 a,b). Over time, the psychopathological problems increase and have been found to be very severe in adult life (Mawhood 2000).

SECTION 3.4: THE ECONOMIC COST OF DEVELOPMENTAL LANGUAGE DISORDERS

The Client Service Receipt Inventory (CSRI) was used to obtain information pertaining to the economic cost of developmental language disorders within the domains of educational provision, health, accommodation and receipt of welfare benefits from childhood into adult life. The CSRI comprises of a participant interview and an informant interview (preferably a parent) in order to obtain the most reliable assessment possible. The economic costs of the DLD group are compared to their non language disordered siblings.

Statistical analysis

The costs were calculated by Juliet Henderson at the Centre for the Economics of Mental Health (CEMH), Institute of Psychiatry, London. A t test (2 independent samples) was used to describe group differences between the DLD group and the siblings.

Educational provision and services

In early childhood, between the age of five and nine years, the entire DLD cohort were in special educational provision, ranging from boarding schools and day schools for speech and language impairments including language units attached to mainstream schools or schools catering for mental and physical handicaps. These schools provided special needs services including speech and language therapy.

This service pattern changed after the age of nine years with eleven DLD boys entering mainstream education whilst the remainder stayed within special educational

provision. This pattern persisted until the entire DLD group left full time education at the age of 16 years. The mean cost of educational provision for the DLD group at £154,926 was significantly higher than the Siblings at £28,657. The significantly higher cost of the DLD group was a result of the special educational provision they all received before the age of 9 years and the few that continued after 9 years of age. The siblings only attended mainstream provision, explaining the lower cost.

Health services

The cost for the receipt of health services was calculated for the twelve months prior to the assessment. The mean cost for the DLD adults was £932 compared to £134 for the siblings, resulting in a non significant effect. Four DLD adults have developed significant mental health problems in adult life and used psychiatric services in the year preceding the assessment. This explains the higher health service costs of the DLD adults. The remainder of the costs for the DLD adults and siblings consisted of standard GP contacts, opticians and dentists.

Accommodation

In comparison to the siblings, the DLD adults achieved a lower level of independent living. At the time of assessment, only 7 DLD adults were living independently compared to 15 siblings. The remainder of the DLD adults either lived independently with parental support (1, 5.9%), in the parental home (5, 29.4%), in sheltered accommodation (3, 17.6%) or residential accommodation (1, 5.9%). The mean lifetime cost of parental accommodation after the age of 16 years was calculated at £43,659 for the DLD adults and £2,860 for the siblings. A significant difference was identified between the DLD group and the siblings ($p < 0.001$).

Lifetime benefits

Calculation of lifetime benefits included unemployment, rented accommodation and income support. The mean unemployment benefit costs of the DLD adults were higher than the siblings due to their histories of brief and temporary periods of unemployment. Only 3 (17.6%) DLD adults had experienced continual lifetime employment compared to 15 (93.8%) siblings.

Of the 7 DLD adults living independently, all of them were living in accommodation rented from local authorities. None of the DLD group were owner occupiers compared to 10 (62.5%) of the 14 siblings living independently.

The mean total amount of benefits reflecting low family income claimed by the DLD adults was £84, 737 and £28,657 by the siblings. A significant effect was identified ($p<0.05$).

SUMMARY OF FINDINGS

1. There are high economic costs associated with developmental language disorders within special educational provision, health, accommodation and receipt of welfare benefits and these persist well into adult life.
2. The lower economic costs for the siblings suggest that the high economic costs are specifically associated with developmental language disorders.
3. The economic costs of the DLD group change, with the incidence of indirect costs, i.e. cost of parental accommodation increasing in adult life.

4. Direct costs also change from special educational provision in childhood to the receipt of welfare benefits and psychiatric services in adult life.

CONCLUSION

Within the domains of education, accommodation, health and receipt of welfare benefits, the mean lifetime economic costs of the DLD adults are much higher than their non language disordered siblings. The DLD adults were more expensive across all of the cost categories. These results are consistent in both childhood and adult life.

The high costs incurred by the DLD adults within special educational provision before 9 years of age conflicts with their eventual poor adult outcome. This raises the argument of whether this specialist provision was cost effective considering the majority of the DLD adults were mainstreamed after 9 years which significantly contributed to their lack of academic attainment. The high costs incurred in adult life through the receipt of welfare benefits and psychiatric services would also support this. Perhaps if specialist services had been financially supported at secondary school age and in early adult life, the emergency direct costs later in adult life could have been reduced.

The types of economic costs for the DLD group have changed from childhood into adult life. In childhood, the direct costs incurred by special educational provision were very high. In adult life, most direct costs arose from the amount of benefits claimed, predominantly as a consequence of poor employment histories and the receipt of mental health services. The progression of the DLD group into adult life also saw

the emergence of indirect economic costs to parents and carers caused by a lack of social and financial independence.

As the siblings share the same parents and family background and have incurred lower economic costs it is proposed that developmental language disorders are associated with persisting high economic costs from childhood into adult life.

CHAPTER FOUR: ADDRESSING THE ISSUES

This chapter brings together all the available data to give a coherent and detailed profile of developmental language disorders. Cognitive data from the assessments in childhood, middle childhood and early twenties to final outcome is explored to give a longitudinal profile of developmental language disorders. Predicting outcome is then investigated to identify whether superior adult outcome can be determined by childhood abilities. The initial hypotheses are revisited as a precursor to exploring the causal and explanatory mechanisms in developmental language disorders. A model of the changing symptomatology and its causal and explanatory mechanisms is then proposed. The methodology of the study is discussed with reference to future study design. The eventual outcome of the DLD cohort is used to highlight their evolving clinical needs and the implications of this for effective service provision. The findings from this study in relation to pursuing future research are then investigated. Finally, a synthesis of the study is presented.

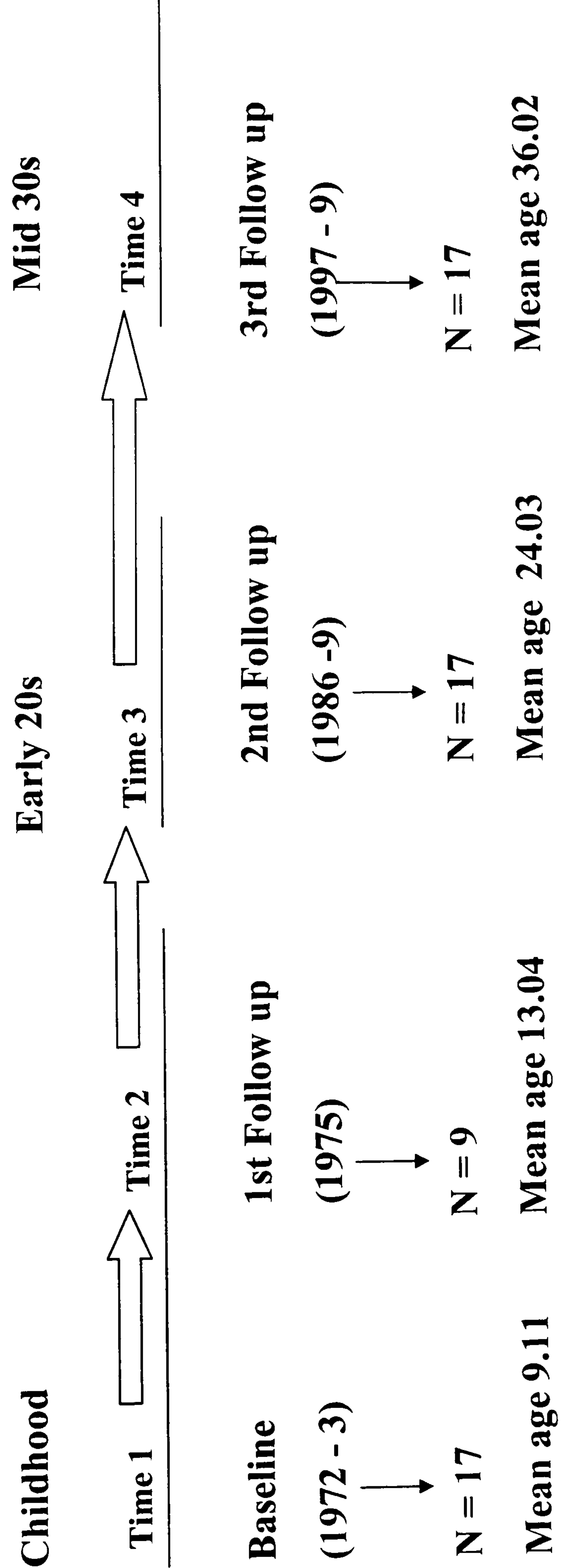
4.1) THE LONGITUDINAL PROFILE OF DEVELOPMENTAL LANGUAGE DISORDERS

The final assessment of the DLD cohort in adult life identified significant deficits in their cognitive abilities. Considering the severity and persistence of these difficulties it is imperative to examine the symptomatology of the DLD cohort during the transition from childhood into adult life. Two follow ups were conducted during this period, the first in middle childhood and the second in their twenties. From each of the four assessments reliable longitudinal data is available to describe the cognitive profile of the DLD cohort within intelligence, receptive and expressive language and literacy.

The initial assessment in early childhood is referred to as Time 1. The first follow up into middle childhood as Time 2. The second follow up into early adult life as Time 3 and the third follow up into their mid thirties as Time 4. Figure 4.1a shows the time scale of the longitudinal comparison.

At the initial assessment (Time 1), 23 DLD boys were recruited and assessed. At the first follow up into middle childhood (Time 2), 15 of the DLD boys from the initial sample were recruited and assessed. At the follow up into their early twenties (Time 3), all 23 of the initial sample were recruited. However, 3 of these participants were found to be hearing impaired and 1 participant declined to complete the cognitive assessment. The 3 hearing impaired participants were excluded from the entire longitudinal comparison, as they now constituted a different diagnostic group.

Figure 4.1a 28 YEAR FOLLOW UP OF MALES WITH DEVELOPMENAL LANGUAGE DISORDER (DLD)



Finally, this current phase of the follow up (Time 4) recruited and assessed 17 participants from the initial sample (excluding those identified as hearing impaired).

Due to recruitment difficulties especially at the first follow up into middle childhood (Time 2) and the effect of attrition on the cohort size over time, the number of DLD participants in the cohort at each time point has varied. For clarity, consistency and reliability, only those participants assessed at Time 4 (mid thirties) have been included in this longitudinal analysis. The final cohort sizes for each of the assessments are:

Initial assessment in childhood (Time 1): 17 DLD boys (mean age 9.11 years)

First follow up into middle childhood (Time 2): 9 DLD boys (mean age 13.04 years)

Second follow up into their early twenties (Time 3): 17 DLD adults (mean age 24.03 years)

Third follow up into their mid thirties (Time 4): 17 DLD adults (mean age 36.02 years)

Unfortunately, the nature of this longitudinal study has prevented the same standardised assessments being administered at each of the four time points. Therefore, it is not viable to statistically compare raw scores, standardised scores or age equivalent scores over the different assessments. However, it is possible to describe the intelligence scores and the longitudinal age equivalent scores from the language and literacy assessments.

Table 4.1a displays the assessments used at the initial assessment and each of the three follow ups. The Wechsler Intelligence Scale for Children (WISC) (Wechsler 1949) was used to measure intelligence at the initial assessment and the first follow up. At time 3, the Wechsler Adult Intelligence Scales – Revised (WAIS – R) (Wechsler 1981) and time 4, the Wechsler Adult Intelligence Scales – Revised U.K (WAIS^{UK}) (Wechsler 1992) were employed. Receptive language was measured with the Reynell Developmental Language Scales (Reynell 1969) at the initial assessment and in middle childhood (Time 2). In adult life, the British Picture Vocabulary scales (BPVS) (Dunn et al 1982) were used at both Time 3 and Time 4. Expressive language was also measured with the Reynell Developmental Language Scales (Reynell 1969) at the two assessments in childhood. In adult life, the Expressive One Word Picture Vocabulary Test (EOPVT) (Gardner 1979) was administered in their twenties and their thirties. Finally, literacy was assessed at the initial assessment and the two adult assessments but not in middle childhood. The literacy assessments employed have generally measured reading accuracy (Wechsler 1993, Gray 1967, Schonell & Schonell 1960), reading comprehension (Wechsler 1993, McBride & McNaught 1985, Pollit 1977, Schonell & Schonell 1960) and spelling (Wechsler 1993, Schonell & Schonell 1960).

VERBAL AND PERFORMANCE INTELLIGENCE

Figure 4.1b shows the verbal and performance intelligence (IQ) scores of the DLD cohort from childhood into adult life. At the initial assessment (Time1), the DLD boys (n = 17) had a mean verbal IQ of 78.1 (S.D 8.0) and a higher mean performance IQ (PIQ) of 89.2 (S.D 8.0) (n = 14, 3 were not assessed on PIQ). In middle

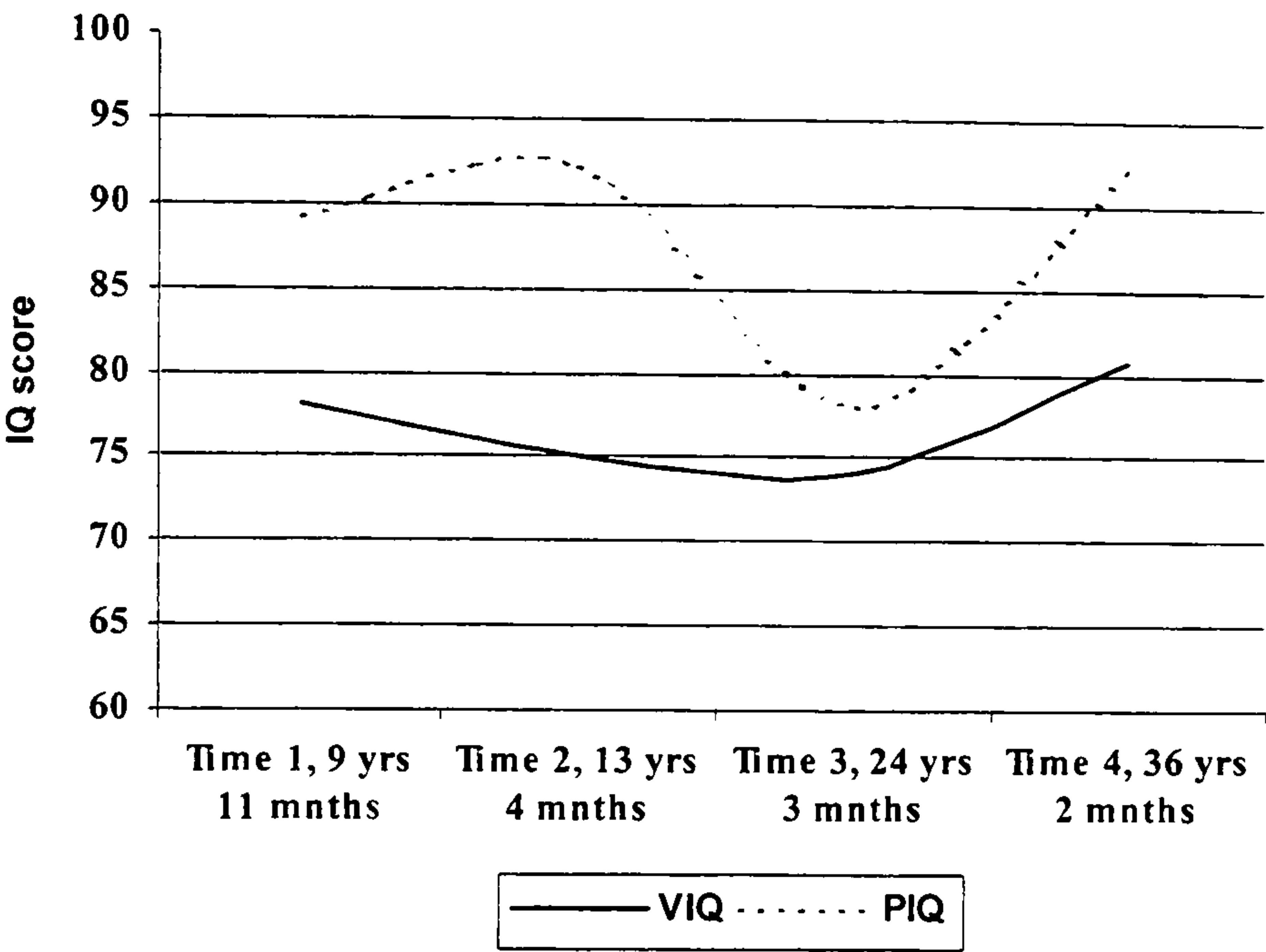
childhood (Time 2) verbal IQ was not assessed but performance IQ had increased slightly to 92.3 (S.D 7.0) (n = 9).

In their early twenties (Time 3), verbal IQ had fallen slightly from 78.1 (S.D 8.0) at the initial assessment to 74.5 (S.D 7.9) (n = 17). However, from middle childhood to their twenties, a major change occurred in performance IQ. A drop of 14 IQ points from 92.3 (S.D 7.0) to 78.0 (S.D 6.7) (n= 17) was identified even though verbal IQ had remained relatively stable.

Table 4.1a Cognitive assessments used at each time point over the longitudinal comparison

	Time 1 Initial assessment in childhood N = 17	Time 2 Middle childhood N = 9	Time 3 Twenties N = 17	Time 4 Thirties N = 17
Mean ages	9.11 years	13.04 years	24.03 years	36.02 years
Assessment area				
Verbal IQ	<ul style="list-style-type: none">• Wechsler Intelligence Scale for Children (WISC) (Wechsler 1949)• Peabody Picture Vocabulary Test (PPVT) (Dunn 1959)	<ul style="list-style-type: none">• Peabody Picture Vocabulary Test (PPVT)(Dunn 1959)	<ul style="list-style-type: none">• Verbal scale of the Wechsler Adult Intelligence Scales (WAIS-R) (Wechsler 1981)	<ul style="list-style-type: none">• Vocabulary and comprehension subtests of the WAIS-R^{UK} (Wechsler 1992)
Performance IQ	<ul style="list-style-type: none">• WISC (Wechsler 1949)	<ul style="list-style-type: none">• WISC (Wechsler 1949)	<ul style="list-style-type: none">• WAIS-R (Wechsler 1981)	<ul style="list-style-type: none">• Block design and object assembly subtests of the WAIS-R^{UK} (Wechsler 1992)
Receptive language	<ul style="list-style-type: none">• Comprehension scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Comprehension scale of the Reynell Developmental Language Scales (1969)	<ul style="list-style-type: none">• British Picture Vocabulary Scales (Dunn et al 1982)• Oral comprehension test (adapted from Neale 1958)	<ul style="list-style-type: none">• British Picture Vocabulary Scales (Dunn et al 1982)• Oral comprehension test (adapted from Neale 1958)
Expressive language	<ul style="list-style-type: none">• Expressive scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Expressive scale of the Reynell Developmental Language Scales (Reynell 1969)	<ul style="list-style-type: none">• Expressive One Word Picture Vocabulary Test (EOPVT) (Gardner 1979)	<ul style="list-style-type: none">• Expressive One Word Picture Vocabulary Test (EOPVT) (Gardner 1979)
Literacy	<ul style="list-style-type: none">• Graded word reading test R I (Schonell & Schonell 1960)• Silent reading test A (Schonell & Schonell 1960)	<ul style="list-style-type: none">• Not assessed	<ul style="list-style-type: none">• Gray oral reading test form A (Gray 1967)• Schonell graded word spelling test A (Schonell & Schonell 1960)• Edinburgh reading tests (shortened version) (McBride & McNaught 1985; Pollit 1977)	<ul style="list-style-type: none">• Wechsler Objective Reading Dimensions (WORD) (Wechsler 1993) 3 subtests: basic reading, reading comprehension, spelling.

Figure 4.1b Comparison of verbal and performance IQ scores of the DLD group over the four assessments



With the exception of one DLD adult, the entire DLD cohort experienced a drop in performance IQ during the transition from middle childhood to their early twenties. The two DLD adults who presented with schizophrenia in their early twenties were separated from the rest of the DLD cohort to determine whether the performance IQ drop could be explained by impaired cognition resulting from the schizophrenia. This psychoses subgroup ($n = 2$) had a mean performance IQ drop of 17 IQ points in their twenties. Table 4.1b shows the longitudinal performance IQ scores of the psychoses subgroup. The remainder of the DLD cohort had a mean performance IQ deterioration of 11.5 points. Although, the drop in performance IQ was larger, the psychoses subgroup was not entirely responsible for the performance IQ deterioration. Therefore, all the members of the DLD cohort experienced a drop in performance IQ.

Table 4.1b Longitudinal performance IQ scores of the psychoses subgroup

	Time 1 Initial assessment	Time 2 Middle childhood	Time 3 Twenties	Time 4 Thirties
DLD A	103	115	99	115
DLD B	75	Not assessed	57	79

From their twenties (Time 3) to their thirties (Time 4), performance IQ increased to 92.0 (S.D 7.0) (n = 17), a similar score to that obtained in middle childhood. Analysis of change over time using a repeated measures t test resulted in a significant improvement ($t(16) = 8.1$; $p < 0.001$) in performance IQ from Time 3 to Time 4. A small increase in verbal IQ from 74.5 (S.D 7.9) to 80.7 (S.D 8.0) was observed but this was not significant.

The intelligence profile of the DLD group over time proved to be interesting. At the initial assessment, a verbal – performance IQ discrepancy was identified, a discrepancy which has remained into adult life. The most significant observation was the substantial drop in performance IQ that occurred between middle childhood and early adult life. This deterioration was temporary and performance IQ returned to a level equivalent to that obtained at the initial assessment.

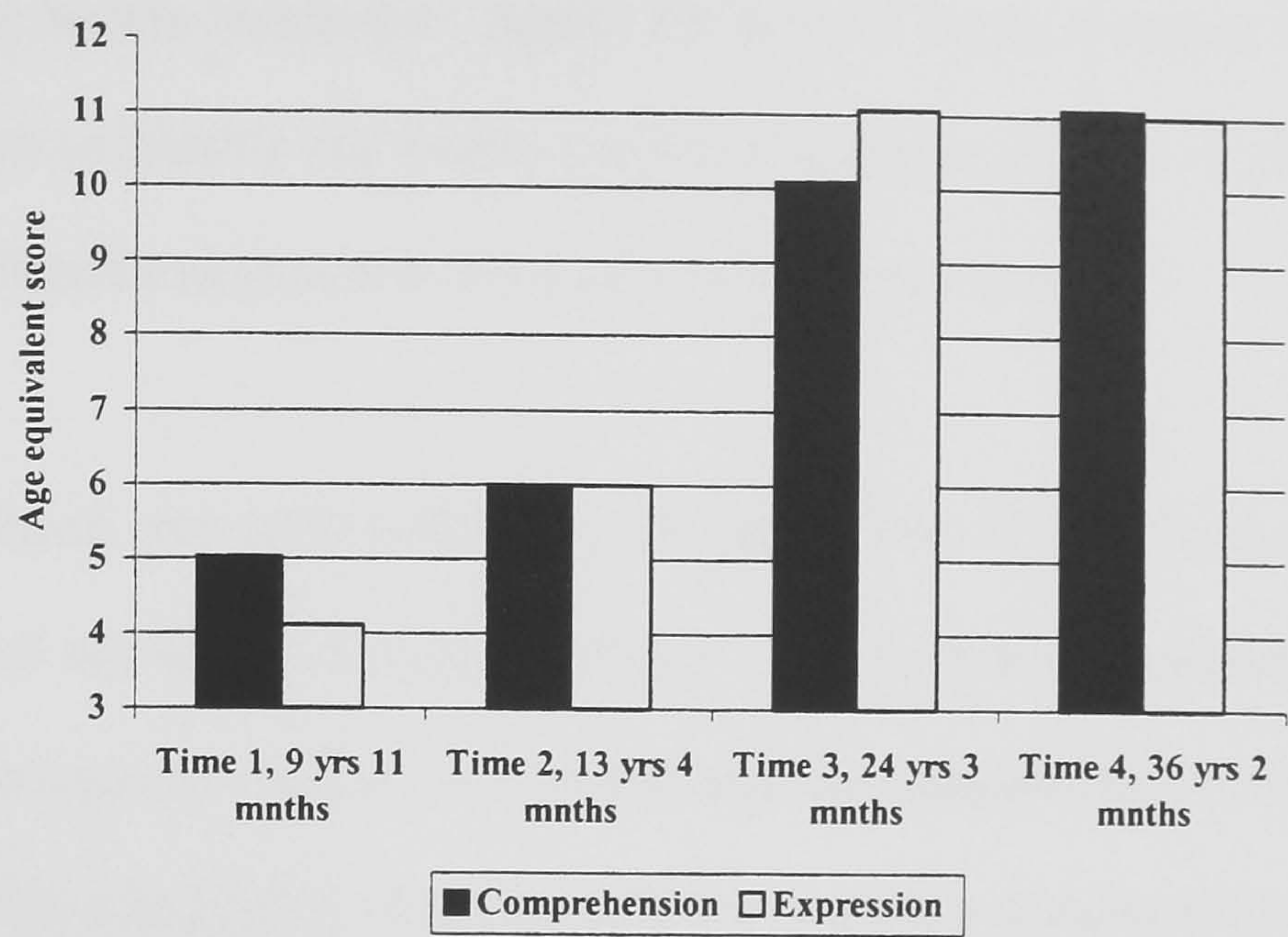
RECEPTIVE LANGUAGE

At the initial assessment (time 1) and the first follow up into middle childhood (Time 2), receptive language was measured using the Reynell Developmental Language Scales (Reynell 1969). At the assessment in their early twenties (Time 3) and mid thirties (Time 4), the British Picture Vocabulary Scales (BPVS) (Dunn et al 1982) and the Oral Comprehension Task (Mawhood 1995) were used. Comparison of receptive

language ability over the four assessments is achieved using the age equivalent scores and shown in figure 4.1c.

The childhood basal mean age equivalent score was 5 years and 2 months (n = 17). At the first follow up into middle childhood (time 2) all 9 of the DLD boys scored above the ceiling level of 6 years (n = 9), showing an overall improvement in receptive language ability. At time 3, the mean age equivalent score increased to 10 years and 9 months (n = 17) and slightly increased again to 11 years and 9 months (n = 17) at the third follow up (Time 4). The BPVS and the Oral comprehension task were administered to the DLD cohort in their twenties (Time 3) and their thirties (Time 4). Analysis of change over time using a t test (matched samples) revealed no significant differences from time 3 to time 4 for the two receptive language assessments. Therefore, there was no significant improvement or deterioration in the receptive language abilities of the DLD group in adult life. The major improvement took place during middle childhood. Unfortunately, due to the low ceiling of the Reynell Developmental Language Scales, it is not possible to identify the exact receptive language abilities of the DLD group at this time and therefore the extent of the improvement.

Figure 4.1c Comparison of the receptive and expressive age equivalent scores gained by the DLD group over the four assessments



EXPRESSIVE LANGUAGE

At the initial assessment (time 1) and the follow up into middle childhood (time 2), expressive language was measured using the Reynell Developmental Language Scales (Reynell 1969). At time 3 and time 4, the Expressive One Word Picture Vocabulary Test (EOPVT) (Gardner 1979) was administered. Descriptive comparisons are made using the age equivalent scores. At the initial assessment (Time 1), the mean age equivalent score was 3 years and 4 months (n = 17). At the first follow up (Time 2) into middle childhood, all 9 of the DLD boys scored above the ceiling level of 6 years (n = 9), showing an overall improvement in expressive language ability. At the second follow up into early adult life (Time 3), the mean age equivalent score had increased to 11 years and 6 months (n = 17) and then remained stable at 11 years and 1 month in their thirties (time 4). The EOPVT was administered to the DLD cohort in their twenties (Time 3) and their thirties (Time 4). Analysis of change over time using a t test revealed a non significant difference between time 3 and time 4. Therefore, there

was no significant change in the expressive language abilities of the DLD group in adult life. As with receptive language, the major change in expressive language took place during middle childhood. Again, the Reynell Developmental Language Scales were not able to identify the exact expressive language abilities of the DLD group in middle childhood and therefore the extent of the improvement.

From childhood into adult life, the DLD group has always presented with severe receptive and expressive language deficits. Improvement in language abilities was observed between the initial assessment and the assessment in middle childhood. Once adult life was gained, language abilities reached a plateau with no improvement between early adult life and their mid thirties. It is difficult to comment on the language abilities of the DLD group between middle childhood and early adult life. In middle childhood, all 9 DLD boys scored above the ceiling of 6 years. Therefore, it is not possible to accurately state the level of their abilities and whether they improved significantly from this time to their early twenties. The deterioration in intelligence during this time would predict only a small improvement in language abilities and therefore language abilities reached a plateau with little improvement in early adolescence.

In language development, receptive language abilities are superior to expressive abilities. Children and adults are capable of understanding much more language than they can produce (Pinker 1994, Reynell 1979, Chomsky 1960). At the initial assessment, the receptive language of the DLD boys was superior to their expressive language. In early adult life, this pattern was reversed and in their mid thirties, receptive language was superior to expressive language by only eight months. The

reversal of the pattern in their twenties and the small discrepancy identified in their thirties suggests possible differences in the language development of the DLD cohort in comparison to normal language development. It is possible that expressive language catches up with receptive abilities because of the plateau reached in early adolescence. The capacity to learn new vocabulary is substantially reduced which subsequently affects the development of expressive language. Therefore, expressive language is able to catch up with receptive language.

However, age equivalent scores are approximate and specific to the individual assessment depending on its standardisation sample which could arguably explain the atypical pattern of receptive and expressive language in the DLD cohort. Yet, the same measures were used over the two assessments in childhood and the two assessments in adult life which limits the assessment variability.

The nature of language is more complex than simply measuring receptive and expressive vocabulary. There are no well standardised tests of receptive and expressive language for adults and therefore assessments are unfortunately limited to measures of vocabulary. This lack of well standardised assessments means that the language abilities of the “average” adult individual are unknown. Therefore, no comparative data is available against which adults with cognitive deficits can be compared to determine the exact levels of their language abilities.

LITERACY

At the initial assessment (Time 1), the Graded word reading test R1 (Schonell & Schonell 1960) provided a measure of reading accuracy and the silent reading test A (Schonell & Schonell 1960) of reading comprehension. Unfortunately, literacy was

not included in the assessment battery at the first follow up into middle childhood (Time 2) and therefore the literacy abilities of the DLD group during middle childhood are unknown.

At Time 3, reading accuracy was measured using the Gray Oral Reading Test (Gray 1967), reading comprehension by a shortened version of the Edinburgh Reading Tests (McBride & McNaught 1985; Pollitt 1977) and spelling with the Schonell Graded Word Spelling test (Schonell & Schonell 1960). At time 4, the Wechsler Objective Reading Dimensions (WORD) (Wechsler 1993) assessed these literacy abilities of reading accuracy, reading comprehension and spelling.

Table 4.1c compares the literacy abilities of the DLD cohort over time. The initial assessment revealed that the literacy abilities of the DLD boys were poor with only 7 of the 17 being able to complete the reading comprehension task (Silent reading test A) but all 17 completing the reading accuracy test (Graded word reading test R1). The reading accuracy test predominantly involved mechanical verbal skill whereas the silent reading test involved silent reading and understanding (where the requirements are to answer questions about the passage read). Their difficulties seemed to be in comprehending the language components of the passages and questions as they were able to recognise and read words (as shown by adequate reading accuracy) but were unable to extract sufficient meaning from them to answer the questions correctly. Literacy was not assessed at Time 2. At Time 3, the mean age equivalents obtained by the DLD group were all around 9 years with spelling the weakest area of ability. From their twenties to their thirties, the literacy abilities of the DLD group did not improve and remained the same.

Table 4.1c Comparison of performance on literacy assessments at time 1, time 3 and time 4

Literacy ability	Time 1 Initial assessment N = 17	Time 3 Twenties N = 17 Age equivalent score	Time 4 Thirties N = 17 Age equivalent score
Reading accuracy	17/17 completed	9.07 (n=15)	9.08
Reading Comprehension	7/17 completed	9.02 (n = 15)	9.05
Spelling	Not assessed	8.06 (n = 17)	9.05

The literacy abilities of the DLD cohort over time are interesting. As children, there was a substantial discrepancy between reading accuracy and reading comprehension. The DLD boys were able to recognise and read words but were unable to understand the meanings conveyed. Snowling, Bishop & Stothard (2000) propose such a discrepancy would not be indicative of dyslexia as dyslexia is characterised by superior reading comprehension to reading accuracy. The literacy impairments of the DLD cohort as children were not characteristic of dyslexia and therefore must have resulted from a different causative factor. This is explored further in section 4.3.

Literacy abilities have paralleled the language abilities of the DLD cohort over time with the eventual outcome of both abilities at an approximate average equivalent to ten years. In adult life, the discrepancy between reading accuracy and reading comprehension diminished. Reading comprehension caught up with reading accuracy. The initial difficulties in reading comprehension occurred alongside severe language deficits and therefore it is logical that the poor language abilities prevented adequate understanding of the meaning of written words. As language abilities improved over time, reading comprehension also improved. This therefore suggests a

substantial link between language abilities and reading comprehension abilities and can explain the poor literacy abilities found in children, adolescents and adults with histories of language impairments.

SUMMARY OF FINDINGS

- A verbal – performance intelligence discrepancy in the DLD cohort was present in both childhood and well into adult life.
- Performance IQ in the DLD cohort was found to be well within the normal range in childhood and in their thirties. Yet performance IQ dropped significantly from middle childhood to early adult life and then increased in their thirties to reach a level equivalent to that achieved in childhood.
- Verbal IQ in comparison to performance IQ has remained stable throughout the longitudinal comparison.
- From childhood into adult life, language abilities improved but reached a plateau in early adult life. The eventual language outcome of the DLD adults remained severely impaired.
- From childhood into adult life, literacy abilities improved but like language abilities, reached a plateau in early adult life. Although, reading comprehension was more severely affected than reading accuracy in childhood, this discrepancy resolved. The improvement in reading comprehension occurring in conjunction with improving language abilities.

CONCLUSION

In conclusion, the cognitive symptomatology of the DLD cohort has changed over time within intelligence, language and literacy. The intelligence profile changed with

a significant drop occurring between middle childhood and adult life. A temporary deterioration which then resolved as the DLD cohort continued in adult life. Language and literacy abilities improved but then reached a plateau considerably below that expected considering the chronological age of the DLD cohort. The combination of deterioration in intelligence and the failure of language and literacy abilities to improve both occurred within secondary school age. Therefore, this changing symptomatology had significant implications for the scholastic and academic success of the DLD cohort.

4.2) PREDICTING OUTCOME IN DEVELOPMENTAL LANGUAGE DISORDERS

The assessment of the adults with developmental language disorders in their mid thirties revealed a poor outcome within cognition, social adaptation and psychiatric functioning. The longitudinal analysis (section 4.1) showed that the initial language impairments improved from the initial assessment to middle childhood but then reached a plateau with no final resolution. Furthermore, at the childhood assessment, the DLD cohort did not present with significant difficulties in social behaviour. The eventual language outcome of the DLD adults was used to subgroup the DLD cohort. The longitudinal profile of each subgroup was then analysed to determine: (a) whether initial childhood abilities could predict eventual outcome, (b) if eventual social adaptation was linked to language and social cognition and (c) if valid and independent subgroups exist in the DLD cohort.

IDENTIFYING PREDICTIVE SUBGROUPS

The eventual receptive language age equivalent scores (as measured by the British Picture Vocabulary Scales (BPVS) (Dunn et al 1982)) of the DLD adults in their mid thirties were used to identify three groups: a good language outcome group (GLO) (receptive age equivalent score over 13 years), a moderate language outcome group (MLO) (receptive age equivalent score 10 to 13 years) and a poor language outcome group (PLO) (receptive age equivalent score below 10 years). Table 4.2a describes the subgroups.

Table 4.2a Description of the good, moderate and poor language outcomes group

Subgroup identified at final outcome (mid thirties)	N	BPVS mean age equivalent score
Good language outcome group(GLO)	8	13 years 7 months
Moderate language outcome group (MLO)	7	11 years 2 months
Poor language outcome group (PLO)	2	7 years 5 months

The longitudinal profile of the good, moderate and poor language outcome groups are examined from the initial assessment (time 1) to their early twenties (time 3) and to the final outcome (time 4). The variables used at the initial childhood assessment were performance intelligence (IQ) (Wechsler Intelligence Scale for Children (WISC) (Wechsler 1949)), language comprehension (Reynell Developmental Scales (Reynell 1969)), a social quotient (Vineland Social Maturity Scales (Doll 1947)) and literacy (Silent Reading Test (Schonell & Schonell 1960)). Final outcome variables consist of performance intelligence (Wechsler Adult Intelligence Scale – Revised (Wechsler 1992)), language comprehension (British Picture Vocabulary Scales (Dunn, Dunn, Whetton & Pintilie 1982)) literacy (Wechsler Objective Reading Dimensions (WORD) Wechsler 1993)), phonological processing (Adult test of nonword repetition (Gathercole & Baddeley 1997)), examination attainment, social adaptation measures (independent living, in a close relationship and in employment (Social/emotional functioning interview (Rutter, LeCouteur, Lord et al 1988)) and a measure of social cognition (Awkward moments task (Phillips & Newman 1994)) Due to the small samples comprising each subgroup, descriptive analyses were used. Table 4.2b displays the variables used in the analysis.

THE LONGITUDINAL PROFILE OF THE SUBGROUPS

Tables 4.2c, 4.2d and 4.2e show the progression of the Good Language Outcome Group (GLO), Moderate Language Outcome Group (GLO) and Poor Language

Outcome Group (PLO). In comparison to the MLO and PLO groups, the GLO group had the highest language and literacy scores in their mid thirties and at the initial childhood assessment. With respect to social adaptation, the Good Language Outcome (GLO) group had the highest Vineland social quotient at the initial assessment and interestingly, in each category of social adaptation in their mid thirties, the GLO group had a much higher percentage of participants with superior social adaptation. For example, 100% were in employment and 75% were living independently. However, the social cognition score of the GLO group was only slightly higher than the MLO group. The GLO group achieved the highest social cognition and phonological processing scores.

The Moderate Language Outcome (MLO) group had poorer language and literacy scores than the GLO group at the childhood assessment which persisted over time. Social adaptation categories showed an impaired level of social functioning across the four categories. However, social cognition was only slightly lower than the GLO group. The phonological processing score was lower than the GLO group but higher than the Poor Language Outcome (PLO) group. The one DLD adult from the cohort who did attain examination success was in the moderate language outcome group

Unfortunately, the PLO group had the most impaired language and literacy scores at the initial assessment and in their thirties. However, they had a higher Vineland social quotient at the initial assessment than the MLO group yet neither of the 2 participants achieved success in any of the categories of social adaptation in their thirties. The PLO group achieved the lowest social cognition and phonological processing scores.

Table 4.2b Assessments used in the prediction analysis

	Time 1 Childhood	Time 3 Early twenties	Time 4 Mid thirties
Performance intelligence	Wechsler Intelligence Scale for Children (WISC) (Wechsler 1949)	Wechsler Adult Intelligence Scales (WAIS - R) (Wechsler 1981)	WAIS – R ^{UK} (Wechsler 1992)
Language comprehension	Comprehension scale of the Reynell Developmental Scales (Reynell 1969)	British Picture Vocabulary Scales (Dunn et al 1982) (B PVS)	BPVS
Social quotient	Vineland Social Maturity Scale (Doll 1947)		
Literacy	Silent Reading Test (Schonell & Schonell 1960)	Edinburgh Reading Test (Pollitt 1977)	Wechsler Objective Reading Dimensions (WORD) (1993)
Examination attainment		Social/emotional and occupational functioning interview – subject and informant based (SEF –S & I) (Rutter, LeCouteur, Lord et al 1988)	(SEF –S & I)
Independent living		(SEF –S & I)	(SEF –S & I)
Close relationship		(SEF –S & I)	(SEF –S & I)
In employment		(SEF –S & I)	(SEF –S & I)
Phonological processing			Adult test of nonword repetition (Gathercole & Baddeley 1997)
Social cognition			Awkward moments task (Phillips & Newman 1994)

All groups showed little, if any improvement in language from early twenties to final outcome. Infact, literacy abilities appear to have deteriorated over this time. Two DLD adults with identified psychiatric disorder (schizophrenia and major depression) constituted the entire Poor Language Outcome Group. The remaining two DLD adults with mental health problems (schizophrenia and atypical psychoses) were distributed equally within the Good Language Outcome Group and the Moderate Language Outcome Group. The lowest performance IQ scores were found in the PLO group which were consistent to the final outcome. Performance IQ in the GLO and MLO group was more complex. Performance IQ was comparable in childhood. In their early twenties, the GLO experienced a larger drop in performance IQ than the MLO group, falling to below the level of the MLO group. However, at final outcome, performance IQ rose significantly in the GLO group but fell again in the MLO group.

Table 4.2c Longitudinal profile of the Good language outcome group (GLO) (n = 8)

	Time 1 Childhood	Time 3 Early twenties	Time 4 Mid thirties
Performance intelligence	90	82	91
Language comprehension (median age equivalent score)	5 years 3 months	12 years 8 months	13 years 7 months
Vineland Social Maturity Scale (mean social quotient)	106		
Literacy (median age equivalent score)	84 (reading quotient)	10 years 9 months	10 years 5 months
Examination attainment		0/8 (0%)	0/8 (0%)
Living independently		3/8 (37.5%)	6/8 (75%)
In close relationship		2/8 (25%)	3/8 (37.5%)
In employment		7/8 (87.5%)	8/8 (100%)
Phonological processing (Total raw score of 28) (mean raw score)			12.6
Social cognition (Total raw score of 8) (mean raw score)			5

Table 4.2d Longitudinal profile of the Moderate language outcome group (MLO) (n = 7)

	Time 1 Childhood	Time 3 Early twenties	Time 4 Mid thirties
Performance intelligence (mean raw score)	91	88	84
Language comprehension (median age equivalent score)	4 years 6 months	10 years 9 months	11 years 2 months
Vineland Social Maturity Scale (mean social quotient)	84		
Literacy (median age equivalent score)	67 (reading quotient)	10 years 3 months	9 years 6 months
Examination attainment		1/7 (14.3%)	1/7 (14.3%)
Living independently		0/7 (0%)	1/7 (14.3%)
In close relationship		0/7 (0%)	1/7 (14.3%)
In employment		2/7 (28.5%)	2/7 (28.5%)
Phonological processing (Total raw score of 28) (mean raw score)			9.5
Social cognition (Awkward moments task) (Total raw score of 8) (Mean raw score)			4.6

Table 4.2e Longitudinal profile of the Poor language outcome group (PLO) (n = 2)

	Time 1	Time 3	Time 4
Performance intelligence (mean raw score)	78	78	78
Language comprehension (median age equivalent score)	3 years 5 months	7 years 3 months	7 years 5 months
Vineland Social Maturity Scale (mean social quotient)	95		
Literacy (median age equivalent score)	64 (reading quotient)	7 years 5 months	7 years 3 months
Examination attainment		0/2 (0%)	0/2 (0%)
Living independently		0/2 (0%)	0/2 (0%)
In close relationship		0/2 (0%)	0/2 (0%)
In employment		0/2 (0%)	0/2 (0%)
Phonological processing (Total raw score of 28) (mean raw score)			8.5
Social cognition (Awkward moments task (Total raw score of 8) (Mean raw score)			2.5

RELATIONSHIPS WITHIN THE SUBGROUPS

A summary of the findings is presented.

- Higher childhood language scores were correlated with superior language outcome within the DLD adults
- Higher childhood literacy scores were correlated with superior literacy outcome within the DLD adults
- Higher childhood Vineland social quotients predicted superior social adaptation within independent living, close relationships and employment within the DLD adults.
- Interestingly, higher childhood language and literacy scores and social quotients did not predict superior academic attainment
- A poor language group at both the initial assessment and the adult outcome was identified but this only constituted two DLD members. In comparison to the moderate and good language outcome groups, the poor language outcome group had poor functioning across all of the measures described.
- Superior adult social adaptation was not associated with higher social cognition scores as the moderate language outcome group had a very similar mean social cognition score to the good language outcome group.
- In childhood, initial performance intelligence scores did not discriminate between the Good Language Outcome Group and the Moderate Language Outcome Group.
- The largest drop in performance IQ in the DLD cohort was in the Good Language Outcome Group.
- Higher mean phonological processing scores were associated with superior language abilities at the initial assessment and at the final outcome.

- The Poor Language Outcome Group had an increased risk of psychiatric disorder
- The comparison of the Good Language Outcome Group and the Moderate Language Outcome Group showed that higher language levels at the final outcome are not associated with superior social cognition abilities

CONCLUSION

This limited data analysis does yield some interesting patterns and relationships regarding prediction in developmental language disorders. Superior performance intelligence, language, literacy and social abilities do predict superior adult outcome within language, literacy, social adaptation and social cognition. The correlation between higher phonological processing scores and superior receptive language ability supports the role of impaired phonological processing as a causal deficit in developmental language disorders.

Although the DLD adults were subgrouped according to their language abilities at the final outcome, the initial language and performance IQ scores were closer at the childhood assessment. It is intriguing that the Good Language Outcome Group was largely responsible for the drop in the cohort's performance IQ in their early twenties which then resolved by final outcome. In their mid thirties, higher social cognition scores were not associated with superior levels of language functioning or social adaptation in either the Good Language Outcome Group or the Moderate Language Outcome Group.

Within the DLD cohort, three subgroups were identified according to eventual language outcome. The Poor Language Outcome Group only consisted of two members and therefore the majority of the DLD cohort fell within the Good Language Outcome and Moderate Language Outcome groups. Using performance IQ, language, literacy and social data it is possible to predict eventual outcome.

Subgroups in the DLD cohort were identified and categorised into good, moderate and poor language outcome groups. However, the final outcome of even the good language group was very much below that initially expected.

4.3) HYPOTHESES REVISITED

The primary aim of this research was to identify the adult outcome of developmental language disorders within the three parameters of cognitive, social and psychiatric functioning. A secondary aim was to complete a fourth longitudinal assessment of this cohort of boys with developmental language disorders who were first assessed in 1975. Therefore, enabling the construction of a longitudinal profile of this cohort from childhood to middle childhood, to their early twenties, and finally to their mid thirties.

The analysis and subsequent integration of this data explored the initial hypotheses and investigated issues specific to developmental language disorders, including definition and classification, stability of symptomatology, explanatory and causal mechanisms and relationships to mental health. This section discusses the DLD cohort's adult outcome within cognitive, social and psychiatric functioning.

THE COGNITIVE PROFILE OF DEVELOPMENTAL LANGUAGE DISORDERS

Initial hypothesis (1)

The receptive and expressive language deficits the DLD group showed in childhood will not have resolved. Therefore, the DLD group will continue to exhibit expressive and receptive language deficits in adult life which are independent of performance intelligence and family background.

The verbal and performance intelligence profile of the DLD adults was intriguing. Full scale IQ was within the normal range, albeit at the lower end. Performance IQ was well within the considered normal range and significantly higher than verbal IQ, a discrepancy which was replicated in the siblings. This finding suggests a possible verbal - performance IQ pattern specific to only the DLD adults and their siblings. The intelligence profile of the DLD adults in their thirties did not differ from that identified at the initial childhood assessment. Therefore, the initial criterion of normal performance intelligence (>70) used to diagnose developmental language disorder in childhood was confirmed well into adult life. Furthermore, the profile confirmed the findings of other studies that have measured intelligence at outcome and used performance IQ as a diagnostic criterion (Stothard et al 1998, Tomblin et al 1992, Aram et al 1984, Paul & Cohen 1984). All these studies found that DLD children, adolescents and adults, with historical or presenting developmental language disorders, have full scale IQ scores

within the normal range where performance IQ is usually higher than verbal IQ.

However, between the assessment of the DLD adults in middle childhood and their early twenties, a drop of approximately 14 IQ points in performance IQ was found. Yet, in their thirties, the mean performance IQ of the DLD adults was almost identical to that found at both the initial assessment and in middle childhood. The reasons for this are unclear, and other follow up studies of children with language impairment have not identified a deterioration in intelligence or fluctuating levels of intelligence. It may have been a result of the short form used to measure IQ but stringent steps were taken to ensure that the most valid short form possible was used. This was achieved by reanalysing the full scale IQ data from time 3 (mid twenties), with various short form compositions to identify the one which best replicated the verbal and performance IQ levels measured with the full scale WAIS-R (Wechsler 1981). The drop in IQ was largely accounted for by the Good Language Outcome subgroup and implies increased susceptibility to IQ changes. The drop in IQ occurred around the same time as the identification of the two cases of schizophrenia, which intrinsically involved significant cognitive deterioration. It is possible that at this time, the DLD adults experienced a temporary cognitive deterioration which for two DLD adults manifested itself in a psychiatric disorder. For the remainder of the DLD cohort, the cognitive deterioration was reflected in lower IQ scores and the plateau in language and literacy abilities. This deterioration was

compensated for when they entered their thirties, but only performance IQ scores improved and not language and literacy abilities.

Even though intelligence was within the considered normal range, the receptive and expressive language abilities of the DLD adults were very much below those expected considering their chronological ages. These language deficits had improved since childhood but they had not resolved. Language development reached a plateau between middle childhood and early adult life where no improvement in language abilities had been made since their early twenties. The initial language deficits were not a result of a maturational lag, thus confirming the diagnosis of a language disorder as opposed to a delay. Other longitudinal studies of children, with initial diagnoses of developmental language disorders have also continued to have both receptive and expressive language deficits both in adolescence and early adult life (Stothard et al 1998, Tomblin et al 1992, Aram et al 1984, King, Jones & Lasky 1982, Hall & Tomblin 1978).

Initial hypothesis (2)

The DLD group will show impaired ability in cognitive areas other than language which are independent of performance intelligence and family background, specifically phonological processing and theory of mind.

Language was not found to be the sole impairment in the DLD adults. Specific deficits in phonological processing and theory of mind were also identified independent of normal performance intelligence and family background.

On the task of phonological processing, the DLD adults had a significant effect of syllable length but not of articulatory rehearsal. Within the phonological loop, the subvocal rehearsal mechanism was intact but storage and representation was impaired. The DLD adults were not able to adequately represent the input in the store which subsequently affected their ability to correctly rehearse and repeat the stimulus.

A phonological processing impairment was only one facet of the complex cognitive profile of the DLD adults. This deficit can effectively explain the lack of receptive and expressive language development but not their intelligence levels, social cognition difficulties, poor adult social adaptation or psychiatric profiles.

The cognitive profile of the DLD adults was further complicated by the addition of deficits in social cognition as shown by performance on the theory of mind tasks. Importantly, the DLD adults had sufficient linguistic ability to understand the social situations presented in the theory of mind tasks but failed to correctly interpret the theory of mind components which involve the ability to infer the beliefs, desires, intentions and emotions of other people (Astington & Jenkins 1999, Astington 1998, Baron- Cohen et al 1997, Happé 1994). The nature of

these social cognition impairments and the contribution of other identified cognitive deficits are not certain. This is discussed further in section 4.4.

Initial hypothesis (3)

The DLD group will have poor literacy abilities in adult life which are independent of performance intelligence and family background.

The DLD group exhibited significant literacy deficits independent of normal performance intelligence and family background with no resolution since childhood. Since their twenties, literacy abilities had remained stable. This confirms literacy impairments are a feature of developmental language disorders. The relationship between language disorders and later literacy ability has not yet been fully established but children with developmental language disorders do seem to be at a greater risk for literacy problems further into adult life (Snowling et al 2000, Stothard et al 1998, Aram et al 1984, King et al 1982, Aram & Nation 1980, Hall & Tomblin 1978). The impaired literacy abilities of the DLD adults correlated with their unresolved receptive and expressive language abilities, suggesting that in the DLD adults there is a relationship between their initial language deficits and their impaired literacy abilities.

There is some debate in the literature as to the nature of literacy impairments in developmental language disorders. The literature proposes that delays and difficulties in language development are common in children with dyslexia, implying that a developmental link may exist between language and literacy

abilities. It has been proposed that dyslexia and specific language impairment (SLI) may simply represent different manifestations of the same underlying disorder. The severity hypothesis and the qualitative hypothesis have been formulated to explain this. The severity hypothesis (Snowling et al 2000) proposes that SLI and dyslexia are characterised by similar cognitive impairments. In contrast, the qualitative hypothesis proposes that both conditions are associated with literacy problems but the underlying cognitive mechanisms are qualitatively different.

Snowling et al (2000) amalgamated the persistent and resolved language impaired adolescents first described by Stothard et al (1998) to assess their literacy abilities. Snowling et al (2000) found significant literacy deficits in this group compared to age matched controls and that these deficits had increased with age. This led Snowling (2000) to reject the severity hypothesis arguing that the developmental trajectory of dyslexia and SLI are different. Children with dyslexia in the preschool years have impaired decoding or word recognition from the outset of learning to read with spelling difficulties becoming an indicator of residual dyslexic impairment. A main feature of children with dyslexia is that they have good language skills that are able to compensate for the specific reading/decoding deficit. In comparison, the basic decoding skills of children with SLI develop normally but reading difficulties become more apparent over time, with spelling abilities remaining relatively intact. At the initial assessment (mean age of 8 years and 2 months), all 17 of the DLD boys were able to complete an assessment of word recognition/decoding but only 7 of the 17 boys were able to complete an assessment of reading comprehension even

though decoding was intact. In adult life, this discrepancy between reading accuracy and reading comprehension diminished. The initial difficulties in reading comprehension occurred alongside severe language deficits and therefore it is logical that the poor language abilities prevented adequate understanding of the meaning of written words. As language abilities improved over time, reading comprehension also improved. The literacy profile of the DLD group as both children and adults does not fit the criteria of dyslexia as proposed by Snowling et al (2000).

Therefore, it is language which qualitatively differentiates SLI and dyslexia. In dyslexia, language ability is relatively intact and this helps children with dyslexia to use context and word meaning to aid their reading understanding. In SLI, decoding is intact but their impaired language skills prevent the effective use of context and word meaning to aid their literacy. For this group, literacy deficits are a consequence of impaired language.

ADULT SOCIAL ADAPTATION IN DEVELOPMENTAL LANGUAGE DISORDERS

Initial hypothesis (4)

The social functioning of the DLD group will be impaired.

Initial hypothesis (5)

The impaired social functioning of the DLD group is related to their language and cognitive deficits and not their family background or level of childhood performance intelligence.

In addition to their cognitive deficits, the DLD adults had experienced significant difficulties in social adaptation compared to their siblings and a general population cohort matched to the DLD cohort on childhood performance intelligence and social class. Well over half of the DLD adults had some problems in establishing relationships. Approximately 50% had never experienced a close sexual relationship, despite being in their thirties. Independence levels were found to be lower than expected compared to the general population cohort. The majority either living with parents or in supported accommodation. Employment levels were also poor with jobs often being temporary and poorly paid.

One explanation for the difficulties in social adaptation is simply that the social demands of life increased with age. Relationships became more complex with verbal communication abilities and social cognition being essential to establishing and maintaining such relationships. Although the DLD adults as children were able to interact adequately with their peers they became less able to do so as they grew older when the demands on their social competence increased. Any initial deficits which were not apparent became more evident over time.

It is also possible that the poor social adaptation of the DLD adults was due to the education they received. Considering the complex cognitive profile of the DLD men, their educational needs were not catered for even though at primary level they attended the best special schools for language disorders. The change in the educational provision of the DLD boys at the age of 9 years in conjunction with their poor academic outcome strongly suggests that the lack of specialist educational provision had a detrimental effect on their academic potential, the majority being mainstreamed at secondary school level and the remainder catered for by MLD schools and schools for children with mental and physical handicaps even though their intelligence was continuously assessed to be within the normal range. At the 36 year follow up, the average reading level was only about 9 years and in great contrast to the scholastic success of their siblings. The failure of the majority of the DLD adults to obtain any formal qualifications on leaving school more than likely affected their employment prospects which subsequently limited social opportunities, increased isolation and reduced quality of life.

PSYCHIATRIC FUNCTIONING IN DEVELOPMENTAL LANGUAGE DISORDERS

Initial hypothesis (6)

The DLD group will continue to be at an increased risk of psychiatric disorder.

Unfortunately, the risk of psychiatric disorder in the DLD group had increased further into adult life. None of the siblings had experienced mental health problems and the prevalence of psychiatric disorder in the general population (NCDS) cohort

was non significant. Therefore, psychiatric disorder was specific to the DLD adults independent of intelligence, social class and family background.

Studies have found that there is a higher prevalence of psychiatric disorder in children with current impairments of speech and language and adolescents with a history of speech and language impairments (Baker & Cantwell 1987a, Baker & Cantwell 1987b, Beitchman et al 1986, Stevenson et al 1985, Silva et al 1983, Baker & Cantwell 1982, King et al 1982 Cantwell, Baker & Mattison 1981, Fundudis et al 1979,). The prevalence is higher in those children and adults where language in addition to speech is involved in the impairments (Baker & Cantwell 1987a, Baker & Cantwell 1987b). Over time, the psychopathological problems increase and have been found to be very severe in adult life (Beitchman et al 1996, Mawhood 1995, Baker & Cantwell 1987a, Baker & Cantwell 1987b). The psychiatric profile of the DLD adults showed an increased risk of psychiatric disorder including psychoses and vulnerability to depression.

ECONOMIC COSTS OF DEVELOPMENTAL LANGUAGE DISORDERS

Initial hypothesis (7)

There will be higher economic costs associated with the DLD group.

The economic cost analysis highlighted the poor adult outcome of the DLD adults. The DLD adults proved to be more expensive than their siblings across the cost categories of education, accommodation, health and receipt of welfare benefits in both childhood and adult life.

The significant reduction in specialist educational provision at secondary school age had major implications for academic attainment and employment opportunities resulting in high costs incurred through welfare benefits.

The progression of the DLD cohort into adult life saw direct costs incurred from special educational provision in childhood change to welfare benefits, psychiatric services and parental/carer support in adult life. This combination of difficulties experienced within employment, independence and health was reflected in higher economic costs:

The economic analysis was not particularly specific as to the exact costs incurred by the DLD adults and siblings but it did achieve a valuable view of the types of services and their approximate costs. Overall, developmental language disorders are associated with persisting high economic costs from childhood into adult life. The nature of these costs change from childhood into adult life.

4.4) EXPLANTORY AND CAUSAL MECHANISMS IN DEVELOPMENTAL LANGUAGE DISORDES

PHONOLOGICAL PROCESSING

Phonological processing and social cognition were explored as possible explanatory or causal mechanisms in developmental language disorders. The significant phonological processing deficit identified in the DLD adults supports the hypothesised developmental link between language impairment and phonological processing. In normally developing children, Gathercole & Baddeley (1990) found phonological processing to be highly associated with receptive vocabulary. Stothard et al (1998) found that a phonological processing deficit was a feature of the cognitive profile of adolescents with persistent language impairment. Gathercole & Baddeley (1995) argue that normal language development in the preschool years is dependent on phonological processing. An adequate temporary representation of a new word in the phonological loop is needed so that a long term stable representation can be constructed so that it can then become part of the individual's vocabulary store. If phonological processing is impaired, the ability to establish long term representations of new words is disrupted and therefore vocabulary development is negatively affected. The receptive and expressive vocabulary of the DLD adults has been severely impaired throughout their lives and receptive vocabulary was significantly correlated with phonological processing. Therefore, the phonological processing impairment of the DLD adults is a specific and persisting deficit that has significantly contributed to their persisting language disorder.

Stothard et al (1998) also found a significant phonological processing deficit in adolescents with resolved language impairment indicating that for children whose language impairments resolve there must be a compensatory mechanism whereby language development can occur without intact phonological processing. However, if a language impairment identified in the preschool years resolves by adolescence then the language impairments of these children must constitute a different diagnostic group to persistent language impaired adolescents and the DLD adults studied here. In language impairments which resolve, phonological processing may be an associated but not the causal deficit involved in the initial language impairment. For the DLD adults, a phonological processing deficit is persistent and correlated with impaired receptive and expressive vocabulary development and is therefore identified as a causal factor of their language impairment. Bishop's study (1996) of language impairment in twins found a phonological processing deficit to be a strong correlate of language impairment in childhood. Comparison of the twins studied showed significant heritability of a phonological processing deficit and therefore phonological processing was put forward as a marker for the phenotype of heritable forms of developmental language impairment. This study would support the theory that a specific causal factor in developmental language disorders is impaired phonological processing.

The DLD adults also had a significant deficit in verbal short term memory which confirms the findings of other studies exploring verbal short term memory in children and adults with a diagnosis of DLD (Stothard et al 1998, Tomblin et al 1992). The cognitive mechanisms involved in sentence repetition are unclear, but it is generally agreed that it places considerable demand on the retention of sequential

information which subsequently places substantial demands on information processing. Information processing refers to the cognitive processing of both linguistic and non linguistic information. Phonological processing within the working memory model would be a specific component of this. Theoretically, sentence repetition involves the ability to encode information, make a decision about the appropriate response, plan and then execute the motoric response. Poor performance on sentence repetition could theoretically occur at any of these levels.

Since the DLD adults showed impaired phonological representation within the phonological loop component of working memory, it is logical to assume that subvocal rehearsal was not a problem in sentence repetition and therefore did not affect the rehearsal of the representation or the execution of the motoric response. Therefore, from the data that the test of sentence repetition provided, it is more likely to be a problem of representation where the sentence to be repeated is not adequately held or represented within a short term memory store. The performance of the DLD adults deteriorated as the sentences increased in length and complexity which would support this theory of impaired representation.

A significant phonological processing deficit was identified in the DLD adults in conjunction with their impaired literacy abilities. A strong relationship between phonological skills and reading development was also found in adolescents with language impairments and controls studied by Snowling et al (2000). Both the groups with SLI and dyslexia had deficits in phonological processing and literacy. However, the direction of the relationships in the diagnostic groups was not established.

For the DLD adults, it is hypothesised that phonological processing contributes to both impaired language development and impaired literacy development. The nature of this contribution may be two dimensional. Phonological processing directly affects language development and then the language difficulties compromise literacy development. Alternatively, phonological processing contributes directly to impaired language development and literacy development. Considering that literacy develops after language, the first alternative carries the strongest argument. Therefore, the literacy deficits are a consequence of poor language development which impaired phonological processing directly contributes to.

Deficits in information processing capacity and/or the allocation of these resources within SLI children has been proposed by several authors (Gathercole & Baddeley 1990, Kirchner & Klatzy 1985) who argue that these serve as early contributors to the initial impairment in language development and subsequently to impairments in literacy development. The memory profile of the DLD adults would support this with the specific phonological processing and verbal short term memory deficits persisting well into adult life. Although phonological processing has been identified as an explanatory deficit in the profile of developmental language disorders, it is still unknown what causes the phonological processing deficit. Assuming that a phonological processing deficit constitutes a cognitive disorder then subtle cerebral damage to the language areas could be a possible cause. Functional Magnetic Resonance Imaging of phonological processing in clinical and normal populations would help to clarify this.

SOCIAL COGNITION

Within the autism literature, social cognition is a complex cognitive ability that has proven difficult to quantify and adequately explain. A theory of mind deficit was originally proposed as the core deficit of autism (Baron – Cohen et al 1985). This deficit referred to impairment in the ability to appreciate that other people's beliefs might differ from one's own. Furthermore, this was also used to explain the lack of social reciprocity which is particularly characteristic of autism but also a significant component involved in everyday communication.

The identification of a theory of mind deficit in adults with a childhood diagnosis of developmental language disorders supports other studies where an association has been found between specific language impairment (SLI) and social cognition (Farmer 2000, Shields et al 1996).

The identification of social cognition deficits in the DLD adults who in childhood did not meet the diagnostic criteria of autism is particularly interesting. It questions whether theory of mind can be a core deficit of autism and the role of such a deficit in developmental language disorders. With respect to theory of mind and developmental language disorders, it is necessary to consider if a deficit in social cognition has contributed to their language deficits and impaired social adaptation.

Locke (1997) proposed that social cognition is the foundation of language acquisition and language cannot develop unless an infant can engage in early social cognition type behaviours. These behaviours have been found to be absent in autistic infants (Baron – Cohen 1989a, Sigman & Mundy 1989) but as yet not

thoroughly researched in infants with developmental language disorders or language impairments. As adults, the DLD cohort presented with language impairments and social cognition deficits. Social cognition in childhood was not assessed but their social characteristics and behaviours were (Bartak et al 1975). Although, the DLD cohort did not meet the diagnostic criteria of autism, some of the DLD boys showed attachment to odd objects ($n = 4$), resistance to change ($n = 3$) and quasi-obsessional behaviours ($n = 4$). In middle childhood, the social behaviours of two of the DLD boys had become worse even though overall language functioning had improved (Cantwell et al 1989). Unfortunately, data pertaining to the identification of these individuals has not been available. However, as the DLD adults have become older, impairments in social adaptation and social cognition became apparent. With reference to Locke (1997), it is not possible to say whether social cognition deficits were present in infancy and if these contributed directly to the language impairments. However, some members of the DLD cohort did initially present with atypical social behaviours in addition to social cognition deficits identified in adult life.

Leslie (1987) and Bishop (1997) claimed that both language and social cognition are underpinned by the ability to process information effectively. This theory implies that social cognition is not dependent on some core psychological construct which enable individuals to infer the beliefs, desires and intentions etc of other people. Presumably, this construct has the potential to exist in all individuals but its development can be affected by impairments in information processing. Social cognition is assessed by performance on theory of mind tasks which inherently involves information processing. As previously discussed, the DLD adults have

phonological processing and verbal short term memory deficits which could affect the development of social cognition abilities but would definitely have affected performance on theory of mind tasks. Whether phonological processing directly affects the development of social cognition is unsubstantiated. However, it is conclusive to say that performance on the theory of mind tasks will have been affected by the identified difficulties in information processing.

Frith & Happé (1994) and Sperber & Wilson (1986) proposed that language and social cognition are separate, independent abilities. Interestingly, the DLD adults had language impairments significantly associated with deficits in social cognition and therefore these abilities are hypothesised to be related. The DLD adults presented with deficits in social cognition and a subgroup with superior performance on the theory of mind tasks was not identified. This implies that the DLD cohort could be a subgroup of developmental language disorders who do have deficits in social cognition in addition to their linguistic impairments.

The social cognition findings from the study do raise some methodological issues relating to the tasks used. Correlations between the theory of mind tasks were found in the DLD adults but not the comparison groups. The cognitive profile of the DLD adults consisted of phonological processing and verbal short term memory deficits, low verbal intelligence and persisting severe receptive and expressive language impairments which logically will have affected performance on the verbal theory of mind tasks. None of these cognitive impairments were identified in the comparison groups who all had a much superior theory of mind performance. This indicates that the theory of mind performance of the DLD adults would have been compromised

by their cognitive impairments which the three theory of mind tasks tapped into. The lack of correlation between the theory of mind tasks in the comparison groups in addition to a paucity of information regarding normative theory of mind ability does question the validity of the tasks. The Eyes Task, Strange Stories Task and the Awkward Moments Task are considered to be second order theory of mind tasks and will tap into theory of mind ability but not necessarily independently of memory, language and intelligence. Recently, the validity of the Eyes Task has been questioned (Baron – Cohen, Wheelwright, Hill et al 2001). Baron – Cohen et al (2001) confirm that the Eyes Task is not a second order task as it only involves the first stage of attribution of theory of mind. This is the attribution of the relevant mental state, i.e. identifying the correct mental state. It does not involve the second stage which is inferring the content of that mental state, i.e. why the mental state has occurred. A second version of the Eyes Task has been reported (Baron – Cohen et al 2001) which is more sensitive to chance performance, language comprehension and ceiling effects. In the future, if theory of mind is to be researched further in autism and other clinical populations, more needs to be known regarding normative theory of mind ability, the role of language ability and theory of mind ability in other clinical populations.

The identification of social adaptation difficulties in the DLD adults supports an association between language, social cognition and social adaptation. The difficulties in social adaptation may be a consequence of the developmental language disorder where poor communication skills may have resulted in social rejection, teasing and isolation. The scholastic problems associated with language impairment may have increased peer rejection and thereby poor self esteem and

confidence. Not all of the DLD adults reported having been teased or bullied either at school or in the work place even though the majority had limited social adaptation and social cognition difficulties.

To summarise, in childhood, atypical social behaviours were identified in some of the DLD boys. Between childhood and middle childhood, language abilities improved but for several of the DLD boys, social behaviours deteriorated. In adult life, the DLD cohort had an approximate language level equivalent to ten to eleven years. Such a language level is considered more than adequate to pass theory of mind tasks (Happé 1994). The DLD cohort passed the language comprehension components of the theory of mind tasks but struggled on the parts that required social cognition ability. Although social deficits were not identified in childhood, the evidence indicates difficulties in social cognition from childhood.

However, it is logical to assume that social cognition is involved in effective social adaptation. The identification of poor social adaptation in conjunction with social cognition deficits in the DLD adults suggests that social cognition could be a specific cognitive deficit or part of a broader cognitive deficit. Such a deficit underlying both the impairment in language development and the difficulties experienced in social adaptation. This assumes that social cognition deficits were present from infancy and caused both the language impairment and the social deficits. The identification of atypical social behaviours at the initial childhood assessment and a deterioration in social behaviour in middle childhood does support this idea of a specific cognitive deficit.

Phonological processing is a specific and persisting cognitive deficit which caused literacy impairments, the plateau in language development and the persisting language disorder. The role of social cognition is more complex. Social cognition deficits were identified in adult life but not assessed in childhood. Atypical social behaviours characteristics of autism were identified in some members of the DLD cohort in childhood. In addition, the social behaviours of two DLD boys had deteriorated by middle childhood. This finding suggests that the social cognition deficits of the DLD cohort were present in childhood, characterised by the atypical social behaviours and which contributed to the social adaptation difficulties experienced by the DLD cohort in adult life.

4.5) ARE DEVELOPMENTAL LANGUAGE DISORDERS PREDICTIVE OF ADULT PSYCHOPATHOLOGY

MECHANISMS

The increased risk of psychiatric disorder in the DLD adults also questions and complicates the exact nature of their diagnosis. Several mechanisms have been proposed to explain a possible relationship between language disorder and psychiatric disorder (Howlin & Rutter 1987, Cantwell & Baker 1977, Beitchman 1985). Common antecedents such as intelligence (IQ), large family size and deprivation have been put forward to explain both the language impairment and the associated psychopathology. The DLD adults in childhood did not present with low IQs and neither were they from large families or backgrounds of significant deprivation. Furthermore, their language impairments were evident in childhood but these were not accompanied by significant psychiatric or behavioural disturbances. It is only in adult life that psychiatric disorder has emerged.

It has also been proposed that psychiatric disorder is a secondary consequence of the developmental language disorder whereby the communication disability is a predisposition to social or emotional problems because of, for example the difficulties experienced in effective communication increase the risk of social rejection. In adult life, the DLD adults experienced significant social adaptation difficulties which were associated with persistent receptive and expressive language impairments. Again, no significant psychiatric or behavioural difficulties were identified at the initial or middle childhood assessments. It is only as the DLD group entered adult life and the demands of life increased that psychiatric disorder emerged.

A third mechanism presented by Beitchman (1985) suggests that an underlying neurodevelopmental delay can account for both the language impairment and many of the associated behavioural problems found in children with speech and language impairments. The neurodevelopmental delay manifesting itself in delays in visual – motor development, general cognition and emotional development. The presence of these symptoms in parallel in children with speech and language impairments increases the severity of the neurodevelopmental immaturity and therefore the risk of psychiatric disorder. The DLD adults at the initial assessment did not present with any symptoms that would be considered indicative of a neurodevelopmental delay.

An alternative and attractive mechanism to consider is that the language impairment and the social impairments both constitute an intrinsic part of the developmental language disorder. Where both the language impairment and the social impairment stem from some underlying specific cognitive deficit such as an initial and underlying deficit in social cognition. Social cognition abilities therefore fail to develop and are subsequently compounded by the difficulties experienced in social adaptation resulting in increased social isolation and increased vulnerability to psychiatric disorder. If the language impairment and the social impairment do stem from an underlying deficit in social cognition, then theoretically, this DLD cohort must overlap with the diagnostic boundaries of autism.

The identification of a social cognition deficit not attributable to low intelligence but associated with severe language impairment raises several important issues regarding the theory of mind construct and its relationship to language development and ability. Having a social cognition deficit cannot presuppose a diagnosis of autism. The DLD

cohort did not meet diagnostic criteria at childhood or any of the three follow ups. The presence of relatively few subtle autistic traits in three DLD boys at approximately 8 years cannot support an initial theory of mind deficit. There is as yet no mechanism which can adequately explain how a theory of mind deficit can result in the emergence of autistic behaviours. The nature of their disorder warrants further exploration other than to simply attribute it to a mild autistic spectrum disorder by explaining it in terms of a theory of mind deficit. Furthermore, impairments in social cognition have been found in other types of non autistic learning disability where language is impaired.

Within the psychiatric disorders identified (schizophrenia, depression and personality disorder) in the DLD cohort, a distinction should be made between liability to psychoses and liability to depression. With respect to psychoses a tenuous but interesting mechanism to consider is that schizophrenia and language are directly related. Language abnormalities are a clinical feature of schizophrenia and it is intriguing that early language disorder is associated with the emergence of schizophrenia in adult life. If a phonological processing deficit is perhaps a result of subtle neurological damage to the language areas of the left cerebral hemisphere then this damage may precipitate the onset of psychoses. This is obviously an unsubstantiated hypothesis and needs much research.

Regarding increased liability to depression, developmental language disorders result in poor academic attainment and social cognition deficits which subsequently causes poor adult social adaptation (i.e. low levels of employment, relationship difficulties).

This then increases social isolation with negative effects on self esteem. The cumulative effects of these life experiences may precipitate depression.

A final and more conclusive three dimensional mechanism is therefore proposed. (1) Developmental language disorders increase susceptibility to psychoses through a direct causal mechanism such as subtle cerebral damage, perhaps to the language areas. (2) Developmental language disorders increase susceptibility to depression via a psychological mechanism. The developmental language disorder results in poor academic attainment and impaired social cognition which contributes to poor levels of social adaptation. The subsequent increase in social isolation and poor self esteem precipitates depression. (3) The causal mechanism and the psychological mechanism compound each other to significantly increase the risk of psychiatric disorder in this diagnostic group.

4.6) THE CHANGING SYMPTOMATOLOGY OF DEVELOPMENTAL LANGUAGE DISORDERS

THE PRESENTING SYMPTOMATOLOGY

This longitudinal analysis of a cohort of boys initially diagnosed with developmental language disorders has provided valuable insight into its symptomatology. Initially, the DLD group were diagnostically described as language disordered with language impairment considered their only cognitive deficit. As they grew older, the language deficits persisted while other cognitive deficits were identified. Language impairment was found to be significantly associated with impairments in literacy, phonological processing and social cognition. Therefore, language impairment was identified to be one facet of the overall cognitive profile.

With respect to intelligence, performance IQ remained within the normal range from childhood to adult life. Verbal IQ was consistently lower than performance IQ. The drop in IQ in early adult life complicated the profile but the eventual IQ level was equal to that identified at the initial assessment. Even though impairments in literacy, phonological processing, language and social cognition became apparent, performance IQ was always within the considered normal range.

The receptive and expressive language abilities of the DLD cohort were very much below those expected considering their chronological ages. These language deficits had improved since childhood but they had not resolved. Language development reached a plateau between middle childhood and early adult life where no improvement in language abilities had been made since their early twenties. The

initial language deficits were not a result of a maturational lag thus confirming the diagnosis of a language disorder as opposed to a delay.

In conjunction with language impairments, poor levels of literacy were identified as a significant component of developmental language disorders. Again, impaired literacy abilities did not resolve, reaching a plateau before adult life. The poor literacy development is associated with poor language development and is not a result of any specific reading disorder. Literacy deficits are therefore a consequence of impaired language development. A facet of the cognitive profile which was particularly revealing was the deficit in phonological processing and short term verbal memory. The phonological processing deficit is hypothesised as a causal factor in the poor language and literacy development.

Social cognition was also identified as part of the cognitive symptomatology. The identification of social cognition deficits in adult life in conjunction with subtle difficulties in social behaviours characteristic of autism in childhood does support social cognition impairment as part of the disorder. However, the role of social cognition in the symptomatology of developmental language disorders remains complex. A simple assumption would be that poor performance on theory of mind tasks indicates impaired social cognition abilities. Yet, the methodological implications of the theory of mind tasks combined with the exact nature of social cognition and the intrinsic role language plays in theory of mind complicates the assumption.

The impoverished social adaptation of the DLD cohort was particularly depressing. The sibling and NCDS comparison groups showed that this was not a result of family background, IQ or social class, suggesting a direct link from developmental language disorder to poor adult social adaptation. The identification of poor social adaptation with social cognition deficits suggests a developmental link between them.

VALIDITY OF SUBTYPES

Rapin & Allen (1987) and Bishop (1997) propose that a developmental language disorder is not a single uniform disorder and that within children described as developmental language disordered there is considerable heterogeneity. Subtypes in developmental language disorders based on presenting behaviours have been identified. This DLD cohort is an homogenous group according to both their distribution and the assessment measures employed at the initial assessment. At the initial childhood assessment, the diagnostic criteria for developmental language disorder was the identification of a severe receptive language disorder in the presence of normal performance intelligence and absence of medical, neurological or developmental difficulties. This initial profile has persisted over time and confirms the initial diagnostic criteria employed. The cohort was divided into three groups according to their eventual language outcome (good, moderate and poor). Yet, these three groups presented with the same longitudinal profile but in different degrees of abilities rather than differing manifestations.

Whether this DLD cohort fits the criteria of a defined subtype is debatable. The symptomatology of this cohort changed over time and follow ups into adult life of other clearly defined subtypes are very limited. The obvious subtype to consider is

semantic-pragmatic disorder (Bishop & Rosenbloom 1987) because of impairments in social cognition overlapping with the boundaries of autistic spectrum disorders. Unfortunately, the specific semantic knowledge of the DLD cohort has never been assessed and pragmatic abilities have only been analysed within social adaptation and the detection of abnormal social behaviours. However, the eventual language comprehension and expression abilities of the DLD adults were too impaired to fit Bishop & Rosenbloom's criteria (1987). Other defined subtypes rely too much on presenting speech and language behaviours and have not explored explanatory causes or the longitudinal progression. As a result, their validity is questioned and it is not possible to compare the DLD cohort to the existing subtypes.

The longitudinal profile of the DLD cohort proposes that this cohort is an homogenous subtype, defined by:

1. A severe developmental language disorder which plateaus before adult life and never reaches resolution. The language disorder results in literacy and academic difficulties.
2. An underlying specific and persisting deficit in phonological processing which has a causal role in the language disorder.
3. An underlying social cognition deficit which predisposes to adult social adaptation difficulties.
4. An increased risk and vulnerability to psychiatric disorder, particularly psychoses, resulting from the specific cognitive profile.

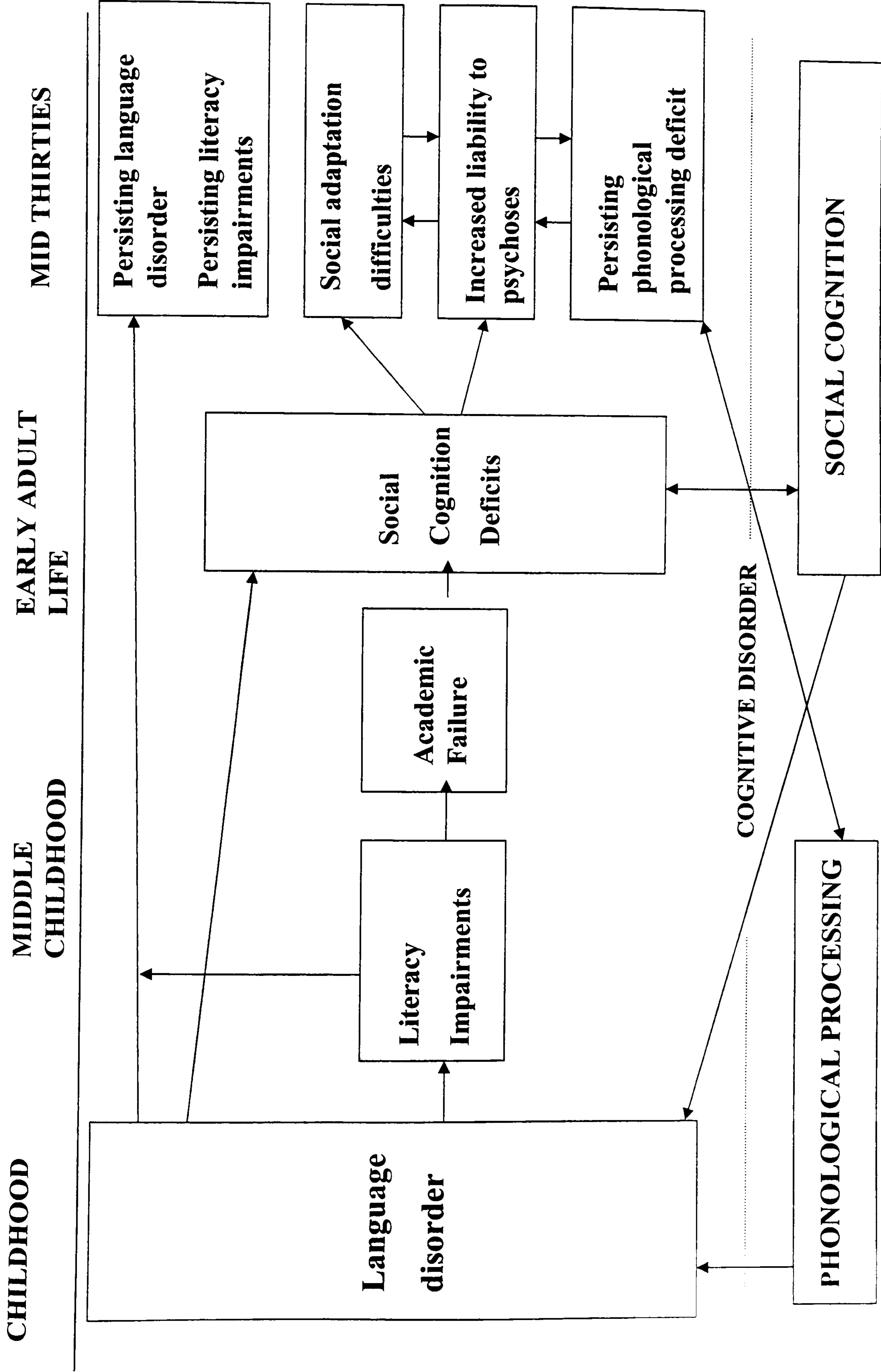
MODEL OF CHANGING SYMPTOMATOLOGY IN DEVELOPMENTAL LANGUAGE DISORDERS

Figure 4.6 is a proposed model to explain the changing symptomatology of developmental language disorders over time. In childhood, the identifiable cognitive impairment manifests itself in (1) a phonological processing deficit resulting in impaired language development. This phonological processing deficit is hypothesised to constitute a cognitive disorder. (2) a social cognition deficit which results in subtle and non pervasive social difficulties in childhood. This social cognition deficit also constitutes a cognitive disorder but is independent to the phonological processing deficit.

Over time, difficulties within academic ability, particularly literacy emerge. Language develops but no resolution is reached even though performance intelligence remains within the normal range. Phonological processing directly affects language development and the resulting language impairment compromises literacy development. Therefore, the literacy deficits are a consequence of poor language development which impaired phonological processing has caused. While language and literacy are failing to develop adequately, social adaptation difficulties become apparent and are compounded by the initial social cognition deficit and inadequate educational provision which fails to equip individuals for the increased demands of adolescence and adult life. The social adaptation difficulties become more apparent as the social demands of life increase. The resulting poor social adaptation attained by the DLD cohort then increases vulnerability to psychiatric disorder and compounds the initial susceptibility to psychoses via the cognitive disorders. Importantly, the transition from adolescence into early adult life is

identified as a vulnerable period with respect to both cognition and mental health. Finally it is proposed that this model constitutes a specific subtype of developmental language disorder.

Figure 4.6 Model of changing symptomatology in developmental language disorders



4.7) METHODOLOGICAL IMPLICATIONS

This study formed the fourth assessment of a cohort of boys first identified in 1968 (Bartak, Rutter & Cox 1975). The initial recruitment and unexpected profile of this DLD cohort combined with the inherent difficulties of longitudinal study design resulted in several methodological issues.

LONGITUDINAL DESIGN

By design, longitudinal studies have inherent methodological difficulties because they span time periods where research findings change their focus and attrition affects sample sizes. The DLD cohort was recruited and fulfilled the role of a language control group to the autistic cohort. Throughout the three previous phases of the study, particularly the Time 1 (childhood) and Time 2 (middle childhood) assessments the autistic cohort was the primary focus. The study was therefore designed around the progression and development of the autistic cohort. Issues pertinent to developmental language disorders had not been identified at the initial assessment and therefore were not addressed.

The findings from the time 3 follow up (early twenties) made it difficult to specifically quantify the extent of the poor outcome of the DLD cohort. This was because their outcome was unexpected. Efforts were therefore made at the time 4 assessment (mid thirties) to try to analyse specific cognitive mechanisms which could have caused the poor outcome. This then made the study retrospective in nature. If for example, social cognition and phonological processing data was available at the initial assessment then the causal and explanatory mechanisms would be clearer.

Attrition, especially at the middle childhood (time 2) follow up was a problem and the data set available at time 2 was limited. Therefore, valuable transition information was lost which affected the analysis of the longitudinal profile.

ASSESSMENT DESIGN

To further explore the profile of the DLD cohort in adult life, three comparison groups were recruited to control for the effects of family background, childhood and adult performance IQ and social class. The initial data exploration showed that the comparison groups were not consistently homogenous in their distribution. Surprisingly, data transformation was needed primarily because the distributions of the sibling group and the IQ match group were skewed. This was because the comparison groups reached ceiling levels on the cognitive assessments. Normative adult language assessments are not available and ones designed for children with low ceiling levels had to be used. This did not affect the DLD adults because of their impaired abilities but did affect the distribution of the data in the comparison groups.

The IQ match group aimed to control for the effects of performance IQ in developmental language disorders. This was achieved but the homogeneity of this group is not certain. It was not possible to control for the effects of education, geographical location, family background or verbal IQ. The low verbal IQ of the DLD cohort can be explained by the language disorder. The verbal IQ level of the IQ match group was not strictly controlled for and its contribution to their overall cognitive profile is unknown. Recruiting an ideal IQ comparison group would involve case by case matching on education, verbal IQ and perhaps socio-economic status.

IMPROVING DESIGN

This longitudinal study provided a wealth of valuable data with respect to progression, outcome, diagnostic criteria and evolving clinical need. In the future, developmental language disorders need to be studied in their own right, maintaining stringent diagnostic criteria regarding intelligence and language levels. The initial assessment of this cohort at approximately 8 years of age was effective in recruiting those children whose language impairments had not resolved and therefore selecting only children with language disorders and not delays. If developmental language disorders are studied as a diagnostic group causal factors can be explored at a much earlier stage to identify and separate causal from explanatory factors.

Larger cohorts need to be recruited, within which subgroups can be delineated according to intelligence level, language level, phonological processing and social cognition as opposed to presenting speech and language behaviours. The longitudinal profile of each subgroup can then be compared to determine the contribution of the initial variables to final adult outcome.

Reliable comparison and control groups need to be recruited at the initial assessment and consistently reassessed. Comparison groups include other diagnostic groups with language involvement, e.g. autistic spectrum disorders and attention deficit disorder to determine if poor adult social adaptation is specific to language disorder or a general consequence of clinical disorder. Controlling for intelligence is paramount due to the criteria defining developmental language disorders. The siblings provided interesting comparative data and a longitudinal perspective of their

progression would have been valuable. In addition to sibling data, an assessment of parents' abilities would further explore familial heritability.

Social cognition needs to be researched further to determine whether it is a discrete entity or if it is dependent on the cumulative effects of higher IQ, language and information – processing abilities. It will then be possible to devise reliable assessments and examine social cognition in normative and other diagnostic populations.

4.8) DO WE REALLY KNOW THE NEEDS OF CHILDREN WITH DEVELOPMENTAL LANGUAGE DISORDERS?

The current philosophy behind service provision is to cater primarily for the linguistic and communication needs of children with developmental language disorders. These children receive specialist educational provision in childhood but as they grow older, support and provision became non existent. From a service viewpoint, it is assumed that the language, literacy and educational needs present in childhood simply resolve as they grow older, presupposing that these children reach a level of functioning which equips them for the demands of adult life.

In childhood the needs of the DLD cohort were thought to be more of a priority than in adolescence and adult life, presumably because children are considered more amenable to intervention. Yet the consequences of developmental language disorders were reported by families to be more pervasive in adult life when no services were available. The high direct and indirect economic cost of social adaptation difficulties and mental health problems show that developmental language disorders continued to incur economic cost but for different care needs than in childhood and adolescence. The social adaptation and mental health status of the DLD adults in their thirties was static with little change expected other than further deterioration, obviously resulting in further economic cost from service provision. In adult life, social adaptation and mental health were the main areas of concern as opposed to language in childhood. For these DLD adults, entry into adult life was not a time of opportunity instead employment opportunities reduced, social isolation increased and family support diminished due to parents becoming elderly. The

outcome of these DLD adults further into adult life is bleak and the resulting economic cost of increased social adaptation difficulties and mental health problems is hypothesised to increase.

No specific help was available for these adults. Their normal performance intelligence prevented access to adult learning disability services. To a certain extent, they have slipped through the remit of educational and social services provision. Speech and language therapy plays an important role in the provision for children with developmental language disorders but this tends to generally diminish the older children become. This study has shown that the needs of this group are very complex and that multidisciplinary support is required as they enter adolescence and adult life. The psychiatric and social adaptation needs are beyond the realm of speech and language therapists and need to be addressed from a multidisciplinary perspective, particularly educational psychologists, clinical psychologists and psychiatry.

With respect to speech and language therapy, more resources should be made available to ensure that these children's needs are met in secondary school and beyond. Anecdotally, speech and language therapists are well aware of the pervasive needs of these children. However, due to a lack of understanding by the NHS and education services of the outcomes and needs of children with developmental language disorders, resources are not made available to either disseminate this information or offer appropriate services to cater for this client group as both children and adults.

Many of the elderly parents in the study blamed themselves for the difficulties their sons' were experiencing in adult life. Knowing that their sons had specific cognitive deficits, which had played a causal role in their difficulties, enabled parents to understand their sons' difficulties and to stop blaming themselves. If this knowledge had been available when the DLD cohort was children, parents could have made more supportive and financial plans to assist their sons and themselves 28 years later. It is imperative that parents of children with developmental language disorders are informed and given relevant information to make informed choices and support their children as much as possible.

The study argues that more appropriate and continuing services such as supported employment schemes would have helped to prevent the severe problems the DLD adults encountered. The study believes that the behaviours they presented with in childhood (i.e. language, literacy and educational deficits) were symptomatic of more pervasive underlying cognitive deficits which were never fully addressed or supported. The adult outcome of these boys confirms that developmental language disorders are a much more pervasive impairment than traditionally thought. For some children, this disability is a lifelong impairment with particular risks for poor social adaptation and psychiatric problems later in life. Effective service provision needs to consider all these issues so that the multidisciplinary needs of this complex diagnostic group can be met in both childhood and adult life.

The complex persisting cognitive profile identified has significant clinical implications. More attention needs to be focused on the interacting cognitive deficits and their evolving presentation in developmental language disorders, particularly the

persisting phonological processing deficit and the literacy and social cognition impairments which become more apparent over time. For these DLD adults, no provision was made to facilitate their specific cognitive difficulties in childhood and adolescence and perhaps appropriate intervention could have improved academic achievement.

Language is often the sole focus of intervention with little attention paid to other contributing cognitive components such as phonological processing and social cognition. Language impairments are very often perceived by health and educational professionals as transient. This study has shown that the presenting language behaviours are symptomatic of pervasive cognitive disorder. This cognitive disorder has significant lifelong implications on the lives of children with developmental language disorders and their families.

4.9) THE FUTURE

This longitudinal study of developmental language disorders provided a wealth of data pertaining to cognition, social adaptation and psychiatric functioning. This study is the first to provide a longitudinal profile of developmental language disorders from childhood well into adult life. An overwhelming finding was the complex cognitive profile of the DLD adults and the identification of a phonological processing deficit hypothesised to be linked to an initial cognitive disorder. This is of particular interest to future research investigating into genetic causes of developmental language disorders.

The DLD adults formed a small but valuable cohort and much larger samples need to be studied. Further follow ups of this cohort are essential with respect to the stability of the profile identified at follow up, age and circumstance of morbidity, cognitive deterioration, increased mental health problems, social circumstances and the types of services this cohort accesses as they continue into life.

Larger samples could be sub divided according to subtypes. Individual subtypes could then be studied to assess changes in social cognition and social adaptation over time. Alternatively, detailed cognitive analysis of other diagnostic groups in adult life could help to determine how specific the cognitive deficits identified in this cohort are to developmental language disorders. For example, is phonological processing impaired in autism and therefore related to the language abnormalities, can a phonological processing deficit in attention deficit disorder explain the language delays often identified or are they a result of a general impairment in

attention, are social cognition deficits present in disorders where social adaptation does not seem to be affected.

The comparison groups were crucial, particularly the NCDS cohort which was able to supply reliable normative data regarding adult social adaptation. The siblings provided good familial data but assessing the cognitive profiles of the parents could be essential in identifying the heritability of developmental language disorders.

Continuing to explore the cognitive profile of developmental language disorders will help to understand how the presenting language behaviours occur and progress. Stringent diagnostic criteria with respect to intelligence and language levels needs to be maintained so that low intelligence cannot be considered as a causal factor in the course of the developmental language disorder. A plethora of studies which use these criteria will provide the much needed data regarding the longitudinal nature of developmental language disorders. This data is essential in planning and providing appropriate service provision for this group as both children and adults.

Studies researching into the heritability, genetic composition and cerebral status of developmental language disorders have explored possible causal factors. Interestingly, the prevalence of language and learning impairments in the families of subjects with DLDs is high (Lai, Fisher, Vhargha-Khardem & Monaco 2001, Plante 1991). Furthermore, familial traits are more concordant in monozygotic than fraternal twins (Bishop et al 1996), strongly suggesting that there is a heritable component in developmental language disorders.

The possibility that human language has genetic roots was first postulated by Chomsky (1959), arising because language is universal, complex and rapidly acquired by children without specific teaching. A rather unique and large family has recently been studied where half of both the males and females were said to have a specific impairment in grammar (Gopnik & Crago 1991). Vargha-Khadem, Watkins, Alcock et al (1995) studied members of the same family to find more widespread deficits including articulation defects, intellectual impairments, linguistic difficulties and subtle oromotor dyspraxia. Fisher, Vargha-Khadem, Watkins et al (1998) narrowed the language disorder in the affected family members to a small segment of chromosome 7, labelled SPCH1. More recently, Lai et al (2001) discovered that an unrelated person to the affected family members also presented with a similar speech deficit and was characterised by a chromosomal translocation affecting the SPCH1 segment and further narrowing the disorder to a specific gene labelled FOXP2. In the unrelated person, this gene was found to be disrupted by the chromosomal translocation.

FOXP2 belongs to a family of genes that are believed to encode transcription factors (i.e. proteins that trigger the copying of genes into messenger RNAs), many of which have important roles in embryonic development. Lai et al (2001) propose that FOXP2 is an important factor in embryonic brain development and results in an as yet unspecified cognitive information processing deficit in developmental language disorders.

Genetic research has to date recognised that developmental language disorders have a heritable component and have also localised this to a gene in one rather unique

family. Magnetic resonance imaging of language abilities and brain regions in developmental language disorders is another area of research that should be used to complement genetic research. It is possible that a gene specified in language impairment could result in identifiable cerebral abnormalities.

Magnetic resonance imaging (MRI) is a non invasive technique which is used to examine cerebral regions. Functional magnetic resonance imaging (fMRI) is able to image cerebral function. Regional changes in blood oxygen are localised and images of the activated brain regions are produced. By imaging people while performing a cognitive task images can be produced of which areas of the cerebral cortex are activated.

Magnetic resonance imaging of children with specific language impairment has identified cerebral abnormalities. Plante, Swisher, Vance & Rapcsak (1991) found that six out of eight boys with specific language impairment (SLI) had atypical perisylvian asymmetries where the right perisylvian area was larger than expected but the left was of the expected size. Plante et al (1991) proposed that this was the result of an alteration in the normal course of embryonic brain development. Trauner, Wulfeck, Tallal & Hesselick (2000) found that 12 out of 35 boys and girls with language impairment had cerebral abnormalities including ventricular enlargement, central volume loss and white matter abnormalities. Interestingly, these 12 children also had abnormal neurological signs. The majority were significantly delayed in reaching motor milestones, particularly walking, suggesting that children with language impairments have dysfunctional nervous systems and that this is manifested

in abnormal motor and coordination skills and abnormal MRI scans. Gauger et al (1997) found that the pars triangular of children with specific language impairment was significantly smaller in the left hemisphere and these children were more likely to have rightward asymmetry of language structures.

With respect to language functioning, fMRI has been used successfully in normals on a variety of language tasks ranging from auditory processing to semantic decision to verbal fluency. This field of research has affirmed the areas of the brain which are known to subserve language functioning. For example, semantic decision has been localised to the prefrontal and temporoparietal areas of the left cerebral hemisphere (Binder 1997, Demb, Desmond, Wagner et al 1995, Spitzer, Belleman, Kammer et al 1996). Tasks of passive and active word and tone listening have been localised to the superior temporal sulcus, middle temporal gyrus, angular gyrus and planum temporale of the left hemisphere (Binder, Frost, Hammeke et al 1996, Millen, Haughton & Yetkin 1995). Therefore, cognitive processing on certain language tasks has been localised and lateralised to certain areas of the left hemisphere. This corresponds well to the literature in adult acquired aphasia and neurobiological theory regarding the cerebral location of language ability.

Research into genetics, MRI and fMRI in language, language impairment and developmental language disorders is in its infancy. The finding from this study of a specific and persisting phonological processing deficit in DLD adults has implications for future research. The phonological processing deficit is hypothesised to be an underlying cognitive disorder. Using fMRI, phonological processing could be investigated in normative populations and developmental language disorders to

determine its localisation and level of activation. This would help to determine if (1) phonological processing is a specific cognitive ability which can be consistently localised to a particular cerebral area, (2) the location and level of activation of phonological processing in developmental language disorders is different to controls and other clinical populations. Phonological processing could be the specific cognitive information processing deficit that arises from a genetic cause. Combining these different approaches will help to determine the nature of developmental language disorders. Using fMRI with the DLD adults is the next step to take.

4.10) IN CONCLUSION

A cohort of boys diagnosed with developmental language disorders (DLD) in childhood was followed up into adult life. Assessments in their childhood, middle childhood and early adult life combined with this assessment in their mid thirties provided a unique opportunity to determine the longitudinal profile and eventual outcome of this cohort. The true consequences of developmental language disorders have been established for the first time.

The DLD boys were initially recruited as a language control group to a cohort of autistic boys. It was hypothesised that their language disorder would resolve over time and no other developmental or behavioural difficulties were expected to arise. Therefore, their eventual adult outcome, particularly the mental health problems and social adaptation difficulties was very unexpected.

The evolving symptomatology identified within cognition, social adaptation and psychiatric functioning was unfortunate, yet intriguing. Even though performance intelligence remained within the normal range, significant cognitive deficits were identified in receptive and expressive language, literacy, phonological processing and social cognition. The initial receptive and expressive language impairments never resolved, confirming an initial and persisting language disorder rather than just a simple language delay.

The childhood language disorder proved to be only one symptom of their pervasive cognitive disorder. This persisting language disorder was symptomatic of the causal cognitive deficit in phonological processing. Literacy impairment was not

attributable to dyslexia but a consequence of the initial language disorder. The combination of language and literacy impairments had subsequent negative implications for academic and educational success.

The nature and role of social cognition was more complex because of its relationship to language. Social cognition was hypothesised to be an additional but independent cognitive deficit which was reflected in impaired theory of mind and contributed directly to the difficulties experienced in adult social adaptation. The identification of such a deficit proposes that the diagnostic boundaries of this group could overlap with those of autistic spectrum disorders. However, caution is needed in the interpretation of impaired theory of mind to presuppose a diagnosis of autistic spectrum disorder.

Developmental language disorders are unfortunately a risk factor for poor levels of social adaptation in adult life. The persisting language disorder, inadequate educational provision and academic failure compounded one another to result in severe social adaptation difficulties. The majority had experienced major problems in gaining and maintaining consistent employment and coping with living independently. Furthermore, the family life of the DLD adults was limited. Very few of the adults were married, had fathered children or even experienced committed relationships. Therefore they were very isolated relying greatly on family for both support and company, resulting in secondary negative consequences for the families involved. No help was available to support these adults to gain and maintain employment, to cope with living independently or to interact effectively and appropriately with their social environments. None of the adults qualified for

specialist support or financial help because their normal intelligence prevented access to adult learning disability services.

The longitudinal cognitive data indicated that the transition from middle childhood to early adult life is a particularly vulnerable time. During this transition, the DLD cohort experienced a temporary cognitive deterioration. This was characterised by a significant drop in performance intelligence accompanied by a plateau in language and literacy abilities and disturbingly for two individuals, the emergence of psychoses. This deterioration was compensated for when they entered their thirties, but only performance intelligence improved and not language and literacy abilities.

The emergence of psychiatric disorder, particularly psychoses in adult life further substantiates the vulnerability of this diagnostic group. This strongly suggests a link between developmental language disorders and an increased liability to psychiatric disorder, specifically psychoses. The complex cognitive profile of developmental language disorders combined with impaired social adaptation proved to be a risk factor for psychiatric disorder. Sadly, two more individuals than those identified at Time 3 (early twenties) developed psychiatric disorder as they entered their late twenties and early thirties.

The initial criteria used to diagnose developmental language disorder in childhood was a severe receptive language disorder in the presence of normal performance intelligence and an absence of medical, neurological or developmental difficulties. This initial profile has persisted over time, thus substantiating the initial criteria employed and confirming the homogeneity of this diagnostic group. However, this

initial profile has proved to be very complex. From childhood to adult life, the symptomatology of developmental language disorders changed. In childhood, the language disorder was the primary concern with literacy and academic failure emerging as adolescence ended. From adolescence to adult life, the symptomatology included the difficulties in social adaptation and psychiatric disorder. As the symptomatology changed, economic costs persisted but changed from primary specialist educational services to state support and mental health services and the unknown indirect costs to families having to support their sons.

The entire DLD cohort was in specialist educational provision till the age of nine years of age, then the majority went into educational provision with very little, if any specialist support. This inadequate provision failed to recognise their needs and subsequently many problems were experienced at secondary school age resulting in academic failure. Clinically, the needs of children with developmental language disorders have proved to be very complex requiring much more multidisciplinary support as adolescence and adult life are reached. More resources should be made available to ensure that these children's needs are met at secondary school level and beyond in order to reduce the risk factors for social adaptation and mental health difficulties.

The cognitive profile of the DLD adults was particularly revealing in establishing causal cognitive deficits which were able to explain the language disorder and later social adaptation and psychiatric problems. Phonological processing was confirmed as a specific, causal and persisting deficit in the receptive and expressive language impairments, but what exactly causes this deficit is unknown. Hypothetically, subtle

brain damage may be responsible and may also contribute to a causal mechanism involved in the emergence of psychoses. The recent identification of a language gene and its possible role in embryonic brain development makes functional magnetic resonance imaging an attractive research area to pursue. Phonological processing could be localised to a specific cerebral area which does not function optimally due to subtle damage which then has implications for cognitive deterioration and psychiatric disorder.

The adult outcome of a cohort of boys diagnosed with developmental language disorders in childhood confirms that developmental language disorders are a much more pervasive impairment than traditionally thought. Developmental language disorders have a specific and persisting cognitive profile which predisposes social adaptation difficulties and psychiatric disorder in adult life. This study proposes that developmental language disorders are a pervasive lifelong impairment, which demands both effective service provision and further research. Without this, these children will continue to experience multiple, complex and increasingly severe difficulties throughout their lives.

VIGNETTES

The vignettes provide a description of each DLD participant from the initial assessment in childhood through to the assessment in their mid thirties assessment. For the purpose of continuity, the descriptions at the initial assessment and early twenties are taken directly from Mawhood (1995). The initials given for each DLD participant are false in order to preserve their identity.

DLD 1 (GD)

Childhood assessments (Time 1 and Time 2)

In the initial study, DLD1 was aged 8 years 3 months. His expressive language was at the 4 year 7 month level and his comprehension was 5 years 10 months. Apart from pronoun reversal he had no abnormal language features: his social functioning was within normal limits and he had no quasi-obsessive or ritualistic behaviours.

Time 3 (early twenties)

At this follow-up he was living at home with his parents and although he talked about living independently his parents felt he would not really be able to cope. Although he could take care of his personal needs and could prepare a simple meal he was not able to take complete responsibility for carrying out domestic tasks, or coping with unexpected events. Recently, he had passed his driving test but had not ever driven without supervision. He managed his own rather simple finances himself and could make major purchases on his own. His grammar was reasonably correct although not very complex and his eye-contact was good. At times it was necessary to listen quite hard to what he was saying because he had quite poor articulation. He seemed to understand the plots of television programmes provided they were not too complex, and his mother described him as a 'soap addict'. He could give full and graphic

reports of events if necessary and could hold a conversation quite well. His range of interests was somewhat limited. He was currently unemployed and spent a lot of time walking around the town observing what was happening. His ambition was to take on an ice-cream round and he spent hours working out the route and practicing sums so that he would be proficient at giving change. He also spent a lot of time studying bus timetables. Until the age of 11 he had attended a language unit and after that a school for mild learning disorders. The longest period of employment he had ever had was one year and he had been in several jobs on building sites or in factories. The reasons he gave for leaving were 'poor pay'; 'didn't get on with the manager', and 'because the factory closed down'. He had an extensive range of acquaintances amongst local shopkeepers and people that he met at bus-stops and in parks and he had several old friends from school, that he had brought home a few times. They would go out together sometimes to the pub, or to a burger bar, and although they seemed to share jokes, his mother did not feel that they confided in each other or that they really cared very much about one another. He enjoyed his own company and did not seem to want more friends. Although he had a sense of humour, this was somewhat immature and he was very keen on practical jokes, e.g. offering to make you cup of tea and then giving you an empty cup. He had not shown any sexual interest and had never had a girlfriend. His mother was concerned that he might not be able to manage an ice-cream round as he had never driven a van, nor had he ever had to manage large amounts of cash, but she was prepared to let him try as he was very keen to do so.

Time 4 (mid thirties)

GD was regularly attending a day centre for adults with learning difficulties, which had helped him to find jobs to apply for. Unfortunately none of his applications had proved to be successful and for the last 11 years GD has been unemployed. GD still talked of taking on an

ice cream round but as yet, nothing had come of this.

At the time of this assessment, GD was in the process of moving into sheltered accommodation which primarily catered for adults with learning disabilities. At the day centre, he had started a relationship with a lady who also attended. They had been seeing each other over the past year and were discussing plans for marriage which GD's parents felt were unrealistic.

DLD 2 (SI)

Childhood assessments (Time 1 and Time 2)

Participant DLD2 was seen initially at the age of 7 years 9 months when his expressive language was above the 6 year ceiling on the RDLS and his comprehension was 5 years 2 months. He showed some quasi-obsessive activities, but apart from these there was no evidence of any deviance in his behaviour, nor in his language or social functioning.

Time 3 (Early twenties)

At follow-up, SI was living with his wife and two young children in a mobile home. He was totally able to look after himself and carry out household chores and he budgeted the family finances sensibly. His speech now sounded very normal except when he got excited and then he would stammer slightly. He was interested in a range of things including badminton, tennis, television and spiritualism, and he was treasurer of the local branch of Gamblers Anonymous. He had become involved in this organisation because both his father and father-in-law were gamblers. In the past his mother said he had plenty of friends and could 'mix with anyone', but since marrying and having children he tended to spend all his spare time with his family. He was very sensitive to other people's feelings and was not easily annoyed. He had

always attended mainstream school, and after leaving he went into the navy but had to come out because of his short-sight. Next he worked as a chef but left because the pay was poor. He was currently working as a street cleaner. His perception of his earlier problems was that he had merely had a stammer which he said he had worked hard to control. His wife was his first girlfriend and they got married in their early twenties. They appeared to have a happy and confiding relationship and despite their lack of money and poor accommodation they were working hard to better their family life.

Time 4 (mid thirties)

At this third follow up, SI was 36 years old. He was still married and living with his wife and two children. They had managed to move out of the mobile home and into a house rented from the local authority. SI had remained employed in the cleansing department of the local council. He had been promoted to a position with more responsibility, which he enjoyed.

SI was content with his situation. He still perceived his earlier problems to be related to a stammer and found it difficult to understand why he was part of the study. He was very concerned that the assessment was confidential, as he did not want anyone to know of his childhood problems. Neither of his children had experienced any developmental or speech and language problems

DLD 3 (MD)

Childhood assessments (Time 1 and Time 2)

At the time of the first comparison participant DLD3 was aged 8 years 9 months. His expressive language was 2 years 10 months and his comprehension was 4 years 11 months. Much of his speech was echolalic and he had frequent neologisms. His social functioning was

within normal limits but he had some quasi-obsessive activities, attachments to odd objects and a few stereotyped hand and finger mannerisms.

Time 3 (early twenties)

At the time of follow-up, MD was 24 years old and he was living at home with his mother. He was able to carry out self-care on his own, but needed guidance in activities such as choosing new clothes. He could help with household chores and could prepare a simple meal. He could also cope with travel on public transport, providing it was local and routine and did not involve any changes. In his spare time he occupied himself reasonably well. But had a rather limited range of activities and spent a lot of time in his room listening to records, or out in the town watching traffic. He had attended a language unit in a local school for several years, and then transferred to a school for children with mild learning disorders.

Since leaving school he had attended a local Social Education Centre. His use of language was largely correct, although his speech tended to be lacking fairly simple complex clause construction. He could understand two-step instructions and follow the plot of television programmes providing they were fairly simple. Although he sometimes looked at books he really only paid attention to the pictures, and he could only write very simple letters. He could converse in a limited way and could also give an account of something although the listener would need to ask questions to fill in the gaps he left. His mother described him as 'rather a loner without any close friends'. Occasionally he would meet up in town with one or two girls from the centre but these were not especially close relationships. One had, in the past, tried to dominate him and he had become quite depressed, not wanting to go to the centre. This was resolved when his mother had a word with the staff. On another occasion he had bought a girl an engagement ring, because he thought this was 'the thing to do' and his mother had taken it

back to the shop. He was unusually routinised in his activities, so that for example he had always got ready for bed early in the evening and still continued to do so. However, this was not compulsive in quality. There were no other language problems evident in the family except that one of his two brothers had been in a remedial reading class for a few years.

Time 4 (mid thirties)

The assessment in his mid thirties identified that MD had never been in paid employment but had participated in some work experience. The day centre arranged a work placement, stacking shelves at a department store. MD did this for a couple of weeks but ran out one day saying that he could not cope with it and did not understand what he was supposed to do. After this MD refused to do any more placements and has subsequently suffered from periods of depression. He receives medication for this and has attended sessions with a clinical psychologist.

Every day, MD was going to the local shopping centre for a couple of hours to help a “friend” set up her stall in the market. His parents say he enjoys this but does not want to receive payment for it, preferring to carry on as he is.

MD had moved out of the parental home and was living in a sheltered flat in his home town close to his parents. His parents continue to be very much involved with MD and he sees them almost everyday. They help with his cleaning and other household chores. His parents reported that they had considered moving away and taking MD with them but MD had backed out at the last minute. His parents do not feel able to move away from MD at present and expressed concerns regarding the future.

DLD 4 (CS)

Childhood assessments (Time 1 and Time 2)

Participant DLD4 was aged 7 years 9 months when first seen. Both his expressive language and his comprehension were above the 6 year level on the RDLS. He frequently produced neologisms but otherwise had no deviant language features: socially he was functioning within normal limits and his only relevant behavioural problem was a marked resistance to change.

Time 3 (early twenties)

When contacted in early adulthood, CS was initially unwilling to take part in the study. This seemed to be due to shyness, and partly because he felt he had 'put his problems behind him'. He eventually agreed and was very co-operative. At the time of follow-up he was living at home with his parents. Although he did not help much with the household chores, he was probably capable of doing so if necessary. Since leaving school he had worked as a stock control clerk in a factory, and he took complete responsibility for managing his own finances. He had his own car and often drove long distances to attend rugby matches. Apart from watching rugby his interests were varied and he liked to watch television, and play card games, squash and snooker. Although he met up with several acquaintances from work, he did not have any close confiding relationships. In any social gathering he would tend to be on the outside rather than joining in, and he found it very difficult to cope with talking to more than one person at a time. He had never shown any interest in having a girlfriend and apparently enjoyed being on his own, with no apparent expressions of loneliness. His mother reported that it was often necessary to ask him questions to clarify what he had said as he tended to make semantic and syntactic errors. Although he did at times chat freely most conversations with him required the other participant to work quite hard to keep it going. He

could write simple messages but if he needed to write any sort of letter his mother would write it for him and he would then copy it. He rarely read anything apart from the sports pages of the newspaper and his mother was unsure how much of this he understood. For several years he had boarded at a school for children with language disorders and then returned home to attend a local language unit. Later he went to a normal comprehensive school, and left without any formal qualifications. He occasionally talked about trying to find a new job, but was not very realistic about the sort of job he would be likely to get. He had seen an advert for a post as an illustrator, for example, and even though he had no training, and no talent for drawing, he still felt it might be worth applying for.

Time 4 (mid thirties)

At the third follow up, CS was 36 years old. He was still living in the parental home with his mum, having never lived independently. His dad had passed away several years ago. He was still working as a stock control clerk having received two promotions since his twenties. In his spare time he still passionately followed rugby and had many rugby team shirts which he took pride in wearing.

CS had recently become interested in trying to find a girlfriend. He was often going out on his own to pubs and clubs to try and achieve this. His criteria was very selective, i.e. tall, slim with blonde hair. He had to date been unsuccessful and felt quite disillusioned with his single status.

He felt his social life was rather limited and he was trying to make new friends by joining social clubs etc but he was finding this hard to sustain.

DLD 5 (DK)

Childhood assessments (Time 1 and Time 2)

Participant DLD 5 was aged 7 years and 9 months in the first comparison. His expressive language was at the 5 year 3 month level and his comprehension was equivalent to the level of 5 years. His intonation was slightly flat, but otherwise his language had no abnormal features. Socially, he was functioning within normal limits and he had no quasi-obsessive or ritualistic behaviours.

Time 3 (early twenties)

When seen in his early twenties, he was living at home with his parents. He had no desire to leave and recognised he would find it difficult to take the responsibility necessary to manage on his own. In all aspects of self-care he was independent and he could carry out most household chores as well as using a telephone competently. He did not drive and his parents had not encouraged him to learn as they felt that although he might pass the test he would not be able to cope with the demands of driving independently. His main interests were model making, watching television, doing jigsaws and listening to records. He also belonged to the Boys Brigade, went cycling and regularly went to rock concerts. Although he joined in with groups to go to concerts by bus, his parents said that he was very solitary and on these occasions was merely one among strangers. He had no friends and although he had sometimes arranged to meet work mates in town they had not ever turned up. His mother felt that he must be lonely but had no evidence of this, as he had never expressed a desire for more social contact. He would join in with family activities, such as putting up decorations at Christmas, but did not fully 'enter into the spirit' of the occasion, only showing a limited amount of pleasure. His mother said, however, that he could respond sympathetically if someone was not happy, and tended to be more thoughtful in this respect than his brothers and sisters, who

had not had any developmental problems. His sense of humour was appropriate for his age and he was not socially disinhibited, although at times he could be very blunt. He had boarded at a school for language disorders for several years, and when he returned home he attended normal schools. A family friend found him a job at a factory but he only stayed one morning as he 'didn't know anyone'. His current job as a machine operator was obtained through family contacts and the factory were aware when they employed him that his concentration span was limited. His mother said that, in effect, it was a form of sheltered job. After being there for a few months he set fire to some paper in one of the outbuildings and was sacked. When his father promised that this would not happen again he was re-employed. His ability to give an account of activities and events, or to converse were somewhat limited and probes were needed to sustain any interaction. Nor did he have very much tonal expressiveness in his voice. He could carry out 2-3 part instructions, however, and his use of language was reasonably accurate. He did not make any plans for the future and had never shown any interest in girls.

Time 4 (mid thirties)

Since the assessment in his early 20s, the firm DK was working for had closed down and DK was made redundant. After four years unemployed, DK again started work in his current job, once again as a factory hand. A family friend also helped him and his family to find this job. In this position, DK reported being very frequently teased and bullied by the other workers. He had had things thrown at him and was being repeatedly verbally abused. DK continued to live in the parental home and DK's relationship status had not changed since the last assessment in his twenties.

DLD 6 (DI)

Childhood assessments (Time 1 and Time 2)

Participant DLD 6 was aged 5 years 10 months when first seen. His expressive language was at the 15- month level and his comprehension was equivalent to 4 years. His peer relationships were markedly abnormal and he rarely made approaches to other children. He showed some evidence of quasi-obsessive interests and some stereotyped mannerisms.

Time 3 (early twenties)

In the adult follow-up, DI was living at home with his mother and was aged 21 years. He could look after himself competently, manage his own finances independently and was able to make major purchases without help. He had a full driving licence and ran a mobile disco in his spare time. Apart from this he had a fairly limited range of interests but did sometimes go to a local youth club or to a roller-skating rink. He was able to join in conversations reasonably well and he could understand most everyday linguistic situations. At times it could be difficult to understand what he was saying as he had a few articulatory difficulties. He would only write very simple phrases and would not be able to read and understand the content of newspaper stories. His mother reported that he seemed to get on well with his work mates and often made them laugh. His sense of humour was described as 'dry' and seemed to be appropriate for his age. Nonetheless, his mother did not think he had any close friends, although she said that he tended to be secretive and often went out on his own. When she asked him where he had been he always replied 'nowhere'. She also said that he did not appear to be lonely, and tended to prefer his own company. It was difficult to tell for certain how he felt, however, as he was so 'deep'. He showed some interest in girls but had not had any girlfriends as far as his mother was aware. When he was interviewed he reported having had several girlfriends, but further questioning revealed that the longest relationship had lasted for

only three weeks and they had been out together only a few times. He said that he 'did not believe in sex before marriage' and that he could not understand why anyone got married, they were 'making right fools of themselves'. His secondary education took place in a school for children with mild learning disorders and when he left he did a course in basic literacy and math skills. After this he went on several Youth Training Schemes, followed by 18 months out of work. He had been in his current job as a machine operator for 2 years. Although he had not had any particular problems in this job he was keen to do something different and had just applied for a cleaning job at a nearby airport. He did not recognise that he had any problems, either now or in the past, and simply said that he could be rather 'moody'.

Time 4 (mid thirties)

At the third follow up, DI was 33 years old. He was living independently with an older man. DI was not contributing to any of the household bills or maintenance. He had moved out of the parental home about two years ago. Over the last ten years, he had had a succession of jobs such as farm work, cleaning, electronics assembly and operating machinery. His current job was at an electronics factory on an assembly line.

DLD 7 (IQ)

Childhood assessments (Time 1 and Time 2)

Participant DLD17 was aged 8 years 5 months when first seen. He frequently produced neologisms but otherwise did not show any particularly deviant language features. His expressive language was above the 6 year ceiling on the RDLS and his comprehension was 5 years 11 months. He would make approaches to other children and had some friends but his peer relationships were nonetheless said to be slightly abnormal in quality and he had a lot of quasi-obsessive activities and rituals

Time 3 (early twenties)

When followed-up into adulthood, IQ was living in his own room in a shared house. This belonged to a charity that provided accommodation for people who were socially inadequate. A housekeeper cooked most of the meals, although he could if necessary look after himself. He was basically in charge of his own finances, but his brother provided some supervision as he had a tendency to lend quite large amounts of money too readily. He acted as the informant for the follow-up interview and described him as 'very gullible'. He desperately wanted to have friends, and tried to 'buy' people by paying when they went out together and lending them money. He tended to think of them as friends until they let him down in some way, e.g. not paying back loans or using his phone, so that on one occasion he had a large phone bill. His brother thought that he took pleasure in their company but that this was probably not reciprocated very much. He often tried to strike up an acquaintance with someone in ways that were inappropriate, e.g. starting a conversation by saying 'do you think I'm handsome?'. In his speech there were frequent semantic errors, e.g. 'I get the *expression*' for 'impression' and syntactic errors e.g. 'I saw a mice', and his utterances tended to be very long with lots of conjunctions. He sometimes flicked through a magazine, but seemed to have little understanding of the content, and he could only write very

simple letters, if he gave a report of something that had happened it would usually contain a lot of irrelevant detail. It seemed to be difficult for him to think of the consequences of his actions, or to know what was the right thing to do in a situation. He had recently joined a course of philosophy evening classes and although he understood very little of what was being discussed he did not feel he could stop going in case he offended the tutor. His interests were rather limited and he spent a lot of his spare time programming and watching his video, and going to discos. He appreciated humour but this tended to be mainly slapstick or rather immature. His brother found him embarrassing at times and he sometimes said things that were inappropriate, e.g. in one of the places he lived as a lodger he was asked to leave because he had asked a teenage baby-sitter about sex and offered her a drink. He found it hard to understand that this had frightened her as he thought this was the 'right way to chat a girl up'. He had never had a girlfriend although he seemed to be attracted to women. He attended a boarding school for children with general learning difficulties and on leaving he started a catering apprenticeship in a restaurant but was sacked when he had a schizophreniform breakdown and was having visual and auditory hallucinations and believing he was Jesus. He had only had brief jobs, and was mainly unemployed. As a child his brother described his preoccupations as so intrusive that they threatened to destroy family life, e.g. winding up clocks so that they all chimed at the same time. In adulthood he was somewhat preoccupied with his video but this was no longer an intrusive interest. He was very compulsive until the age of 18, but although unusually routinised in adulthood he was no longer compulsive. He had little insight into the nature of his problems and said 'I'm the odd one out in the family, I don't take exams'. The main concerns his brother had were that he was lonely and that he was often taken advantage of.

Time 4 (mid thirties)

At this follow up, IQ was 37 years old. At the time of assessment, IQ was living in sheltered accommodation provided by the local social services. He was in the process of moving out into a housing association flat to live independently. Since the assessment in his early twenties, IQ had experienced two more relapses involving hospital admissions. IQ had not worked since he was 19 years old but was regularly attending a day centre and had completed a basic course in maths and english.

His Dad who was very much involved in IQ died a couple of years ago and his step mum says that IQ is too much of a handful for her and has nothing to do with him. His sister took on much of the responsibility for Ian but she had recently emigrated. His brother had become involved with IQ again but reported that he would rather keep him at a distance from his life.

IQ was still under the care of the local community mental health services and a community psychiatric nurse was to visit him regularly when he moved. He had a girlfriend who also had severe mental health problems who he expressed concern about. They were planning to live together in IQ's flat.

DLD 8 (RQ)

Childhood assessments (Time 1 and Time 2)

Participant DLD8 was aged 9 years when first seen and his expressive language was at the level of 5 years 3 months. His comprehension was above the ceiling of 6 years on the Reynell. His intonation was rather flat and he occasionally produced neologisms. He would be unwilling to participate in group activities and would rarely approach other children. The quality of his peer

relationships was said to be slightly abnormal. He showed some evidence of ritualistic behaviour and marked quasi-obsessive activities and attachment to odd objects.

Time 3 (early twenties)

In his 20s, RQ was living independently in a flat belonging to an organisation that specialised in providing accommodation for disabled people. It had been his idea to move away from home, and although his parents had helped him approach the charity he had played a major part in making the necessary decisions. He looked after himself entirely independently and did all his own shopping, cooking and household chores. In addition, he managed his own finances and was meticulously careful with his money. He was also able to travel independently on public transport to places some distance away. He was able to cope with most things provided he had come across them before but had difficulty with the unexpected, e.g. his cooker started to smoke and he didn't know what to do. Although he had a very well-organised daily routine and did not like making changes to this, he would if it became necessary. He hated being in a situation where he felt rushed, and he had to be allowed to do things at his own rather slow pace. In addition to his developmental problems he had very poor eyesight and this, in combination with his slowness meant that he could not cope with the demands of a full-time job. He did voluntary work cleaning a local cathedral twice a week, but other than this filled his time with doing his domestic chores, weight-training at a local health club and looking after his extensive collection of model cars. He was very interested in this collection, but not really preoccupied. Another favourite pastime was just walking around the town and watching people, e.g. workmen painting lines in the road. He was at a boarding school for language disorders for several years and then transferred to a school that catered for children with a very mixed range of disorders. His speech was now fairly well developed and his grammar was largely correct with occasional errors (e.g. irregular plurals). He could follow a fairly simple plot but would get lost if the story became too complex. If he gave

an account of events he would pay attention to minute detail, and he could converse well although he would tend to talk about things he was interested in. He had some articulation difficulties that made it hard at times to understand what he was saying. At present, he was reading the Bible at bedtime. His father said that he understood very little of it but kept persisting hoping it would eventually make sense. He enjoyed company but could not cope with being around other people for very long. Even when his parents came to visit him he would tell them when he wanted them to go and would make it plain they were not welcome if they arrived early. He could make acquaintances but sometimes started conversations in slightly inappropriate ways e.g. by talking about the Guinness Book of Records and saying 'Did you know that....?'. He did not appear to want any close friends although he met up with the curate at his church every couple of weeks for a chat and a meal, and seemed to enjoy his company. Although he had a strong sense of fun his sense of humour was rather immature e.g. simple puns, and he would not understand the more subtle types of humour. He showed some understanding of how other people were feeling and his mother said he would show appropriate concern if someone was not feeling happy. Girls were of absolutely no interest to him. He could only see the difficulties involved rather than any of the positive emotional aspects and said 'girls are just trouble'.

Time 4 (mid thirties)

At the third follow up RQ was 37 years old. He continued to live independently in the flat with his mum living nearby. His father who had taken the responsibility for RQ had passed away several years ago. RQ's mum found her additional responsibility difficult to manage at times. His mum helped him with his washing and he often went to her house in the evenings to eat. Several times a year, RQ would accompany his mum and her friends on outings and short holidays. RQ continued to work voluntarily at the cathedral. In addition, he was attending a local college where he was completing basic courses in computers and wood work. He was no

longer weight training but still enjoyed collecting model cars. His mum felt that he was very different to her other son and she had always sought unsuccessfully to find an explanatory reason for this.

DLD 9 (JN)

Childhood assessments (Time 1 and Time 2)

Participant DLD9 was aged 9 years 6 months when included in the first comparison.

His expressive language was above the 6 year ceiling on the RDLS and his comprehension was at the 6 year level. He was occasionally echolalic, and his speech was at times stereotyped, but apart from these he showed no other deviant language features. His peer relationships were reported to be slightly abnormal, although he did make approaches to other children and would join in with group activities. He had no stereotyped, ritualistic or quasi-obsessive behaviours.

Time 3 (early twenties)

At follow-up, JN had spent some time living independently, but although he was able to look after himself personally, domestically and financially he had returned home after only a few weeks. Apparently he had found it difficult to get up for work on time and gave this as his reason. Since leaving school he had been in a variety of jobs including farms, factories and hotels. Several of these jobs were Youth Training Schemes and had come to a natural end. He had never been unemployed for any length of time and had always found work through his own initiative and without any help from his family. His current job was taxi-driving in a small town. Work was his main interest. Any other pastimes he had tended to be rather limited and short-lived. In recent years he had been interested in playing the electric organ, and also in growing plants, but neither

Hobby had lasted very long. He was able to get on with colleagues at work but did not really have any friends whom he shared activities, or anyone in whom he confided. Nevertheless, he did not seem to be lonely, or to want any more social contact. His conversation was rather limited, as was his ability to give a report. He could respond appropriately but the responses tended to be rather short with little elaboration, and although he smiled and was friendly he had little spontaneous 'chat'. His voice was rather quiet and he had some articulatory difficulties. He could write simple letters, if necessary, but these had many grammatical and spelling errors. It was rare for him to read a book or newspaper and his mother thought he would find it difficult to understand the content of most newspaper items. He had only had one sexual relationship. This had lasted for several months, and he had also taken a couple of other girls out. His main difficulty with these relationships was that the girls wanted to talk a lot and he did not want to.

Time 4 (mid thirties)

At the third follow up, JN was 37 years old. He had moved out of the parental home and currently was living independently with his girlfriend and her children. This seemed to be a transient arrangement where JN would periodically return home to live. At the time of assessment, JN and his girlfriend were planning to get married. His mother and brother did not approve of this, believing that he would not be able to cope with married life.

JN had had various jobs over the last ten years, including farmwork, refuse collection, lorry driving and delivering pizzas. His current position was as a groundsman for the local council on a short term contract.

He reported having friends in the workplace and would go to the pub to meet friends on a regular basis.

DLD 10 (TI)

Childhood assessments (Time 1 and Time 2)

In the initial study, participant DLD10 was aged 6 years 10 months. His expressive language was 3 years 2 months and his comprehension was at the 4 year level. His intonation was rather odd and he made frequent use of neologisms. He had some friends but would be unwilling to join in group activities and his peer relationships were not considered adequate. He had no quasi-obsessive or ritualistic behaviours

Time 3 (early twenties)

In adulthood, TI was living at home with his father and stepmother. In all aspects of self-care he was entirely independent and he could use a telephone and manage his finances himself. Most of his spare time was spent pursuing his preoccupation with buses and his less intense interest in CB radio. He spent a lot of time hanging around bus stations, going on bus journeys when he could afford it and looking at bus magazines. His social overtures were somewhat limited and he would speak if spoken to but would not make the first move. There were two friends that he visited regularly, one shared his interest in buses, the other was interested in CB radio. These relationships were clearly selective but did involve some apparent pleasure in each others company and some sharing of confidences. However, there was still a slightly odd quality to them because of their restricted range of interests. He did not appear to be lonely. Until the age of 11 he boarded, first at a school for children with language disorders and then at one for children with multiple handicaps. When he returned home he attended a normal comprehensive school where he was in the remedial stream. After school he had several jobs (labourer, refuse assistant) from which he was made redundant through closures, but in another one he was sacked for being too slow. The majority of the time since leaving school he had been unemployed. He was keen to get a job, however, and the previous year had, on his own initiative, written a letter describing his interest in buses and had photocopied it and sent it to all the bus stations in Britain asking if they would give him a job.

The assessment in his mid thirties revealed that this proved to be successful. A coach station in London offered him a work placement for a year. TI mainly helped passengers get to the right coach and deal with any problems the drivers had. Unfortunately, the placement was terminated at the end of the year due to a lack of funds and TI has not worked for the last five years.

His eye contact was variable and his spontaneous speech was limited in quantity and flexibility. He could understand and carry out 2-3 part instructions and could follow the plot of a television programme provided it did not get too complicated. Quite often he would look at a newspaper but his father thought he would mainly read the very short stories and he was not interested in the more serious topics such as politics. He had never had a girlfriend and did not show very much interest in having one although his father said that he did look at pornographic magazines.

Time 4 (mid thirties)

In his 30s, TI was living at home with his mum as he had been unhappy living with his father and stepmother. Since his 20s, he had lived independently for a year but this had been unsuccessful. His landlord took advantage of him by overcharging his rent so that his mum and sister had to lend him a substantial amount of money to help him out. After this incident, TI returned to his mum's home. Recently, TI had mismanaged his benefit claim and had therefore not received any income for three months. He failed to inform anyone about this. It was only when he was found smoking "dog ends" that his mum realised his situation and helped him to resolve it.

TI's relationship status remained unchanged. However, he had recently become involved with the local homeless community, spending a large amount of time in their company and according to his family he was slowly adopting their lifestyle.

DLD 11 (MX)

Childhood assessments (Time 1 and Time 2)

In the first comparison, participant DLD11 was aged 9 years 1 month. His expressive language was at the 5 year level and his comprehension was 4 years 7 months. Socially, he was functioning within normal limits; he had no deviant language features and no quasi-obsessive or ritualistic behaviours. At the time of the adult follow-up he was aged 25 years and was living at home with his parents. Although he was entirely independent in all aspects of personal care and also managed his own finances competently his mother thought that he would have difficulty in coping with all the household chores and taking the responsibility needed to manage his own home. He recognised that he would find it difficult and was content to stay where he was for the foreseeable future. He was learning to drive but had failed his test twice. He had boarded at a school for children with language disorders for several years and after returning home he had attended a normal secondary school where he was put in a remedial stream. At this stage he was teased mercilessly and played truant to avoid it. For 6 months at the age of 13 he did not go to school at all and would hide in the local woods all day. He left school with no formal qualifications and went to a college for several years to learn basic skills such as English and mathematics.

Time 3 (early twenties)

On leaving school he got a job on a building site but didn't like it. He was injured by some heavy equipment after only a few days and never returned after his sick leave. After this he had several long spells of unemployment interspersed with a few jobs, each lasting less than 1 year. In one job he was badly taunted and left because of this. At the time of the interview he had been unemployed for over 2 years. He had an ambition to work as a park warden but was unsure how to go about it and found it very difficult to fill in job application forms. A lot of his time was spent studying maps and planning trips to places he had no means at present to visit, e.g. New Zealand and Iceland, and his mother reported that he was often in a world of his own, daydreaming about

travelling overseas. He had a very good memory for details such as train timetables, which he could commit to memory and also an unusually good memory for places that he had visited. His sense of humour was rather immature. Syntactically and semantically his language was largely correct although there were occasional errors. He could understand and carry out 2-3 part instructions, but he sometimes had trouble following the plots on television. If required to give an account of something he could do so but would need a number of prompts to keep going. His mother reported that he could also take part in a conversation reasonably well but this might be reduced in amount and flexibility. His eye contact was rather variable and he often looked away when talking to someone, apparently because of his shyness. His voice was also very quiet. He could often read newspaper headlines but found it difficult to make sense of the story itself and if he needed to write a simple letter his mother would plan it out for him and he would copy it. In any sort of social situation he was extremely shy and he avoided social contact wherever possible. His mother could only remember him having one friend in the past, and this had been 3 years previously. Even this friendship had only entailed a few trips out together and one visit to the house, but he had no friends now. His mother did not feel that he was lonely, however, although he did express a wish to have a girlfriend, partly because he wanted to be like his brothers. In recent years he had developed crushes on several girls in the locality but did not know how to approach them. He recognised that he had problems in mixing with people and attributed this to his shyness. His mother reported that he often said 'people pick on me because I'm quiet'.

Time 4 (mid thirties)

At the third follow up MX was 36 years old. He was still living in the parental home and had never lived independently. His older brother had died very unexpectedly several years ago.

After the second follow up (early twenties), MX started to work with his Dad and younger brother putting up scaffolding. This was arranged by his Dad and continued for about four years until his

Dad retired. Since then MX has worked as a “hod carrier” on an agency basis on building sites all over the UK. The jobs last for approximately three months and he works for about 8 months a year. Currently he is unemployed while waiting for another job to come up.

MX reports that he has been badly bullied in the work place in the past but has now found ways to cope with this. One of which is to work out a lot so that he is physically very strong which he feels stops people picking on him.

When he is not working MX does voluntary work at a nearby animal sanctuary which he enjoys a lot and would like to do full time if it were possible. He still wished to be a park warden. He also talked about wanting to get married but as yet had not been able to find a girlfriend. His social network continued to be extremely limited. He had passed his driving test and several times a year went “touring” around Britain in his car on his own. Preferring to sleep in his car rather than finding and paying for accommodation.

DLD 12 (PX)

Childhood assessments (Time 1 and Time 2)

When seen in the initial study, participant DLD12 was aged 7 years 8 months. His expressive language was at the 4 year 6 month level and his comprehension was equivalent to 4 years 11 months. His only deviant language feature was an odd intonation pattern but socially he was markedly abnormal with few friends and very limited joining in of group activities. He had marked attachments to odd objects: definite quasi-obsessive activities and some evidence of hand and finger stereotypies.

Time 3 (early twenties)

At the time of the adult follow-up, PX was living with his mother and brother in socially difficult circumstances. He was entirely independent in looking after himself and was working as a security guard. This job was his first and he had only been in it for 5 months, having been unemployed until then. He managed his own finances and was reliable; getting to work on time and remembering appointments. His grammar was immature and the complexity limited but he could understand reasonably simple plots and instructions. Although he could make appropriate responses in a conversation he had little spontaneous chat and his voice was rather lacking in emotional expression. He liked looking at books about animals but appeared to look mainly at the pictures rather than reading the words and his written ability was very poor. In his spare time he had a limited range of interests including drawing, watching videos and listening to tapes. He did not make acquaintances easily and had no friends. Although he often complained of boredom he did not express any desire for more social contact. His sensitivity to other people's feelings was limited, and his mother said if she was unhappy he would take no notice and would carry on as normal. He was very easily annoyed and his family had to be very careful not to upset him. He appeared to have little insight into his difficulties and showed no interest in girls at all.

Time 4 (mid thirties)

At the third follow up PX was 36 years old. He had moved out of the parental home three years ago and was living independently in a flat nearby. He still went to see his mum every day who cooked for him. He took no interest in his flat, tending to fill it with rubbish that he found. He continued to present as an "odd" character and as a result (according to his family), the local residents had vandalised his property.

At the assessment in his 20s, PX had started work as a security guard. His brother in law was already working at the firm and helped PX to secure the job. PX reports that one of the managers

where he worked took a dislike to him so he decided to leave. He was asked to go back which he did and was then sacked. His Mum reports that he was sacked because some of the other security guards did not like his attitude in the work place as he was always swearing and often did not arrive on time to start his shift. PX has not worked for the last ten years. At the time of assessment, he was attending a local college, which provided courses for adults with learning disabilities.

PX continued to have limited social contact relying on family for support and he did not express any interest in forming any other relationships. He spent the majority of his spare time wandering the streets of the city where he lived.

DLD 13 (AN)

Childhood assessments (Time 2 and Time 2)

Some of the early data on participant DLD 13 is missing, but it is known that he was aged 7 years 10 months when first seen and that his expressive language was assessed as being at the 4 year 2 month level, whilst his comprehension was 3 years 6 months.

Time 3 (early twenties)

At this follow up, AN was living as a lodger in a family. He was given this accommodation by the local Social Services department after he had suffered several schizophreniform episodes, and the aim of the placement was to provide him with basic supervision in preparation for living totally independently. Before his breakdown he had worked in a supermarket collecting trolleys, but now attended a Social Education Centre during the day. He joined in with many of the activities that were organised, such as discos, but had no real friends that he confided in, or with whom he shared interests. He tended to prefer his own company and did not appear to be lonely. Nor did he show any interest in girls or express any sexual interest. His interests were rather limited in range but he

had a tape collection and liked listening to music. He could understand 2-3 part instructions well but had limited understanding of plots, and both his reading and writing abilities were very limited. He could provide a report if probes were given to sustain it and could converse reasonably well although he would be inclined to talk about things he was interested in. In general he was not socially disinhibited, and had no compulsive behaviours or difficulty in adapting to new situations.

Time 4 (mid thirties)

At this follow up, AN was 36 years old and living in sheltered accommodation in his home town. Since the first breakdown in his twenties, AN had experienced two more, both requiring hospital admissions. AN's mum had died and his dad had remarried. His dad visited AN every week or took him out. AN's mum had always taken the responsibility for him and his dad's new wife did not want to be involved with him in any way which obviously caused difficulties.

AN participated in the activities provided by both his accommodation and the mental health services. He very much enjoyed woodwork and the other practical activities. He had never been well enough to contemplate employment.

DLD 14 (PH)

Childhood assessments (Time 1 and Time 2)

Participant DLD 14 was aged 10 years when first assessed and both his expressive language and comprehension were above the 6-year ceiling on the RDLS. He often used neologisms in his speech but apart from these he showed no other abnormal language features; his social functioning was within normal limits and he had no ritualistic or quasi-obsessive behaviours.

Time 3 (early twenties)

When followed-up into adulthood, PH was living independently in a flat. He had originally moved away from home to live with his girlfriend, but they had split up and he continued living there on his own. He cared for himself entirely independently and managed his own finances sensibly. His range of interests was very limited and mainly revolved around pigeons, which he bred and raced. Every evening he would take the pigeons training and he often went to pigeon-racing meetings. His parents described him as a loner. He would speak to others if they spoke first but was unlikely to initiate contact. Despite meeting people through pigeon-racing he did not appear to have any close confiding relationships. His mother felt that he preferred his own company and was not really lonely despite his lack of friends. Between the ages of 7 and 9 he boarded at a school for children with language disorders, but after that he returned home and was at normal schools where he did not get any further speech therapy. For 10 years he had been in his present job which involved maintaining drains and sewers. His speech now sounded fairly normal and although he would occasionally chat freely it was rare for him to have a real conversation. He did read, but this was nearly always magazines about pigeons. The relationship with his girlfriend had lasted for 5 years and during that time they lived together and had a child. His interest in pigeons preoccupied him to such an extent that he didn't really join in much with anything else, and this probably contributed to the break-up of the relationship. They appeared to enjoy each other's company but also lacked the ability to confide in one another, both being inclined to 'bottle up' their feelings rather than expressing them.

Time 4 (mid thirties)

At the time of follow up, PH was 38 years old. He was living by himself near his parental home. His dad had recently died. Since the last assessment, PH had been made

redundant and was doing similar work but on a casual basis. His son had moved away but they saw each other regularly. He was still very involved in pigeon racing, continuing to keep his pigeons at his mum's house. His social life was based around pigeon racing and as a group they often went out for an evening or sometimes away for a weekend. He had a couple of girlfriends over the last ten years but none of these relationships had become serious.

DLD 15 (DB)

Childhood assessments (Time 1 and Time 2)

Participant DLD15 was aged 6 years 3 months when first assessed. His expressive language was above the 6 year ceiling on the RDLS and his comprehension was at the 5 year 5 month level. He had occasional echolalic episodes but otherwise there were no obvious linguistic, social or behavioural abnormalities detected.

Time 3 (early twenties)

At follow-up, DB was living at home with his parents but planning to move out and live with his girlfriend in the near future. Only a few weeks before he was followed-up he had told his parents that he and his girlfriend were expecting a baby and this had resulted in a lot of turbulence within the family. He had attended an ordinary school and on leaving had obtained a City and Guilds qualification in joinery. His current work was as a joiner on a building site. He had not had any problems at work and had been in employment for most of the time since leaving school. Most of his leisure time was spent with his girlfriend, and although his range of interests was not very wide he did have some friends that he would go out to the pub with, and play snooker with sometimes. These seemed to be fairly normal relationships and he liked being with other people. His parents said that he could at times be obstinate but he was not unduly bothered by changes of plan or routine. The main problem that had arisen in the past

few years was his uncontrollable temper. These outbursts of anger always occurred within the context of the family and he had on several occasions attacked his father and threatened his mother. He was always very sorry afterwards but tended to blame it on external factors outside his control. This aggression was causing his parents great distress and as a result of the problem coming to light during the follow-up interview the family were referred to a local psychiatrist for family therapy. He had some feelings of inferiority and these seemed to be related to his sister who was slightly older than him, had always been academically successful and was now a dentist. Her success in some ways highlighted the difficulties he had experienced. His language now sounded mostly normal and he could understand and follow plots quite normally, His reporting and conversation were both slightly limited, however, as he did not have a lot of spontaneous or social chat, and it required some effort to keep a conversation going to and fro. His sense of humour was also rather immature for his age. He was planning that he and his girlfriend would get married before the baby was born and seemed to have a realistic concept of what was involved in this step, both practically and emotionally.

Time 4 (mid thirties)

At this follow up, DA was 36 years old. He had married his girlfriend from the previous assessment and they had had two children. They had since divorced and he was living with his second wife and their daughter in local authority accommodation not far from his parents. He continued to work as a joiner on a contract basis.

For the last ten years, DA's parents and family had found DA even more difficult to cope with. He has been in trouble with the police for fighting and domestic violence (against his present wife) for which he was placed on remand. He has attempted suicide on many

occasions and been given a diagnosis of a personality disorder. He has spent several weeks on psychiatric wards over the last two years.

DA sees his parents regularly and frequently asks them for both emotional and financial support. His mum has been depressed as a result of the difficulties she has had with DA and has received counseling for this which she reports has helped. Since the assessment, DA's parents reported that DA and his second wife have now split up and he is living on his own.

DLD 16 (RT)

Childhood assessments (Time 1 and Time 2)

Participant DLD 16 was aged 6 years 3 months at the time of the first comparison. His expressive language was assessed as being at the 4 year 8 month level and his comprehension was 4 years 5 months. He was occasionally echolalic and his intonation was rather flat, but otherwise there were no obvious abnormalities in either his language, behaviour or social functioning.

Time 3 (early twenties)

At follow-up, RT was living at home with his parents. He had been engaged for several years and was planning to get married and live independently, but the relationship had recently ended and so he had changed his plans. At the time of the follow-up he was aged 23 years and was entirely independent in all aspects of personal care, travel and managing his finances. He had a range of leisure interests including playing the guitar, singing, and going to the cinema, to discos and to judo classes. Making friends did not seem to be a problem, he was gregarious, had a good sense of humour and was able to strike up acquaintances e.g. in pubs, quite easily. He had at least one 'mate' with whom he shared a number of interests, and in

whom he confided, and also had several other friends that he would meet up with sometimes. His early education was in a normal primary school and at a later stage he transferred to a school for children with mild learning disorders. Since leaving school he had almost always been in employment but had changed his job very frequently. The work he had done included being a waiter and working on a building site, and each change of job seemed to have been either because they had come to a natural end or for positive reasons such as more money or to avoid shift work. His current job was in a small shop where he undertook a range of duties including stacking the shelves and manning the till. He had done this job on and off since schooldays and the owner was always willing to take him back again when he needed a job. His speech sounded very normal and he could chat freely and spontaneously and give a good report of events. He realised he had suffered from language difficulties in the past but now said he had 'left all that behind'. His writing was still poor, however, and although he could write a short letter it would be full of grammatical and spelling errors. He did not read very much but tried hard to improve his general knowledge and would often look up things that he was unsure about in an encyclopaedia. The relationship with his fiancée had lasted for 2 years and seemed to have been close, caring and quite normal. The main thing that had marred it had been her jealousy, and she eventually left him for someone else. He was very upset by this and hoped to meet another girl and get married one day.

Time 4 (mid thirties)

At the time of this follow up, RT was 35 years old. He had moved out of the parental home 7 years ago and was living in a rented flat in the same city. The move was prompted when his mum decided to move to a smaller flat and both he and his brother had to leave. He was working as a kitchen hand in a restaurant and had experienced minimal periods of unemployment over the last ten years despite having several changes of jobs. Since his

twenties, he had been engaged a further three times but each relationship had fallen apart. He reported that he very much wanted to get married and have children but hadn't yet met the right person for him. He felt lonely at times but often went out with people from work and his brother and his friends.

DLD 17 (RN)

Childhood assessments (Time 1 and Time 2)

In the initial comparison, participant DLD 17 was aged 9 years and 2 months with language ages of 4 years 4 months and 5 years 2 months for expression and comprehension respectively. His intonation was rather flat, but otherwise had no deviant language features or odd behaviours, and his social functioning was fairly normal.

Time 3 (early twenties)

At the time of this adult follow up, RN was aged 26 years and living at home with his parents. Although his mother did most of the household chores he was capable of looking after himself and had no difficulties in managing his finances or in using the telephone, and had organised a holiday abroad independently. He had a full driving licence and a range of activities including listening to music, watching television, going to football matches and the pub, and playing pool. His mother reported that he was able to strike up acquaintances quite well, apparently got on well with people he met at work and had a good sense of humour. Nevertheless, he had no particular friends. His mother thought he must be lonely although he had never expressed any feelings of loneliness or any desire for more social contact. He attended a normal school until he was a teenager when he was found to be making homosexual advances to other boys and was sent away to an assessment centre where he stayed until leaving school. After this he had several different jobs either as a gardener or a

factory worker, but was made redundant several times due to cut backs and closures. His speech now sounded fairly normal with only occasional grammatical errors. He was able to follow plots well, give a full report of events and could converse normally, although his voice was slightly lacking in emotional expressiveness. His written ability was less good and although he filled in job applications sometimes, his mother reported that these often had spelling errors. He did not read books, but looked at a newspaper every day and appeared to understand much of what he read. His mother was not sure whether he had ever had any sexual relationships and said he was so secretive that if he had he would be unlikely to discuss them with her.

Time 4 (early twenties)

At the time of the follow up, RN was 38 years old. He was still living with his mum in the parental home, having never lived anywhere else. He was working as a labourer for a local firm. He claimed that he had been working for this firm for the last 12 years. Despite working, he is frequently in debt and often borrows money from his mum. He still very much liked his own company, preferring to go out on his own and even on holiday on his own.

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APPENDICES

APPENDIX 1

Method used for choosing the short form of the WAIS-R

At the third follow up (time 3, early adult life) the full length WAIS-R was used along with the Ravens matrices to measure verbal and performance IQ. For the purpose of the fourth follow up a short form of the WAIS-R was used in order to reduce the length of the assessment battery.

Much deliberation was taken over the selection of subtests to comprise the short form. It was necessary to devise a short form which would give the most accurate IQ scores for the DLD subjects so that the IQ scores from the fourth follow up could be compared with the IQ scores from the third follow up. In addition the length of the short form had to fit within the time limits of the assessment battery.

There are two basic methods to choosing a short form, the first advocates administering all of the eleven subtests but in a shortened form by only administering the second or third item of each subtest. The second method is to administer a subset of the eleven subtests. This latter approach is more useful as a participant's performance on the individual subtests can be investigated further.

Prorating is the conventional method used to predict full length intelligence from the selected subtests chosen for that short form. Prorating involves converting raw scores to scaled scores and then using the mean of these subtests for those subtests that were omitted. The resultant sum of scaled scores is then converted to an intelligence (IQ) score.

The type of short form ranges from one verbal and performance subtest to four verbal and three performance subtests. Crawford, Allan & Jack (1992) and Silverstein (1985) have investigated

the reliabilities and validities of various short forms to assess their ability to provide the most accurate short form IQ scores in comparison to full length IQ scores. For example, Silverstein (1985) used data from the WAIS -R standardisation sample to determine the validity and reliability of two and four subtest short forms using the prorating method. The four subtest short form consisting of the vocabulary, arithmetic, block design and picture arrangement subtests proved to be more reliable and valid than the two subtest short form.

In comparison, Crawford, Allan and Jack (1992) advocate that prorating is not the most accurate method for predicting reliable short form intelligence scores. This is because prorating is not accurate for those participants who gain extreme scores on the subtests selected for the short form as it results in less extreme full scale IQ scores.

Crawford, Allan & Jack (1992) tested two hundred normal participants with a full length WAIS-R and then used regression equations to determine which of seven different short forms best predicted the full scale IQ score. The regression equations were built directly to predict full length IQs from the sum of the administered subtests' age graded scaled scores.

For each of the proposed short forms the age graded scaled scores for the relevant subtests were added together. The relevant full length IQs were then regressed on these totals giving the correlation of the short form with full scale IQ, the constants and beta weights for the regression equations and the standard error of measurement for each equation.

The following table shows the short forms used in the regression analysis by Crawford, Allan & Jack (1992):

	Subtests	
Author	Verbal	Performance
Silverstein (1982)	Vocabulary	Block Design
Silverstein (1982)	Vocabulary Arithmetic	Block Design Picture Arrangement
Reynolds, Wilson & Clark (1983)	Information Arithmetic	Block Design Picture Completion
Britton & Savage (1966)	Vocabulary Comprehension	Block Design Object Assembly
Crawford, Allan & Jack (1992)	Comprehension Similarities	Block Design Object Assembly Picture Arrangement
Crawford, Allan & Jack (1992)	Comprehension Similarities Arithmetic	Block Design Object Assembly Picture Arrangement
Warrington, James & Maciejewski (1986)	Vocabulary Digit Span Arithmetic Similarities	Block Design Picture Completion Picture Arrangement

All the four subtest short forms had significantly greater predictive validity than the two subtest short forms. The six and seven subtest short forms had significantly greater predictive validity than all the four subtest short forms. Suggesting the trend that the more subtests there are in a short form the greater its predictive validity.

For the fourth follow up it was necessary to find a reliable short form which would be accurate so that the IQ scores of the DLD participants could be compared to the previous follow ups. Both prorating and regression analysis were employed in the reanalysis.

Method

The sample consisted of 20 participants who had a well documented history of developmental language disorders with a mean age of 24 years and 10 months (range 21 years 10 months to 28

years 2 months; S.D. = 1.56 years). As part of the assessment battery at the third follow up 19 of these subjects completed a full length WAIS-R. The mean verbal IQ was 75.3 (S.D. 7.8) and the mean performance IQ was 78.4 (S.D. 10.4). The mean full scale IQ score was 74.89 (range 55.0 to 87.0, S.D. 7.38).

Pro rating the time 3 full scale IQ data

The initial analysis involved prorating the time 3 WAIS-R data using two previously documented short forms which had shown a high correlation with full scale IQ. These short forms were:

(1) Reynolds, Wilson & Clark (1983)	
Verbal subtests	Performance subtests
Information	Block design
Arithmetic	Picture completion
(2) Britton & Savage (1966)	
Verbal subtests	Performance subtests
Vocabulary	Block design
Comprehension	Object assembly

Results from the prorata analysis

Short form	Prorata Short form IQ	Standard deviation	Range	Full length IQ at time 3
Reynolds, Wilson & Clark (1983)	74.89	9.26	49.0 - 87.0	74.89
Britton & Savage (1966)	75.84	9.69	53.0 - 99.0	74.89

Although the means were similar to the full length mean, the standard deviations were above nine standard deviations. Therefore reliability analysis was employed to determine which of the eleven subtests reduced the reliability of the full scale IQ scores the most and therefore should be included to comprise the most reliable short form possible.

Reliability analysis

The verbal subtests vocabulary, comprehension, arithmetic and the performance subtests object assembly, picture completion and block design reduced the reliability of the time 3 full scale IQ the most. Therefore it was logical to include these subtests in the construction of a short form. Table shows the short forms devised on the basis of the inclusion of these six subtests. These six short forms were then correlated with the time 3 full scale IQ and the full scale which the short forms produced using the time 3 data and the prorating method.

The six subtest short form had the highest correlation with time 3 full scale IQ yet was the furthest one away from the full scale IQ mean. This result questioned its reliability as a short form and therefore regression analysis was used next to try determine which of the six short forms would be the most accurate predictor of time 3 full scale IQ.

Composition of short forms

Short form	Subtests	
	Verbal	Performance
Six subtests	Vocabulary Comprehension Arithmetic	Block Design Object Assembly Picture Completion
Five subtests	Vocabulary Comprehension Arithmetic	Block Design Picture Completion
Four A	Vocabulary Arithmetic	Block Design Picture Completion
Four B	Vocabulary Comprehension	Object Assembly Block Design
Four C	Vocabulary Arithmetic	Block Design Object Assembly

Regression analysis

For each of the six proposed short forms, age graded scaled scores for the relevant subtests were added together. The relevant full length IQs were then regressed on these totals.

The betas and constants for each short form could then be used to predict full scale IQ for that short form using the following formula:

Long form FSIQ × beta + constant = predicted full length IQ

The formula was applied to each of the nineteen subjects for each of the five short forms.

The short form Four C with the subtests of vocabulary, arithmetic, block design and object assembly proved to be the most accurate for thirteen out of nineteen cases. Therefore, this short form was chosen to measure intelligence but with the addition of the comprehension subtest which could be removed for analysis if the IQ scores differed greatly with its inclusion.

APPENDIX 2:

Oral Comprehension Task (Mawhood 1995)

ORAL COMPREHENSION TEST
(adapted from Neale 1966)

Instructions: Begin with passage 1. If the subject passes only one question for a single passage, discontinue. Otherwise, give all three passages. The score is the total number of questions answered correctly. Correctness is judged in terms of the main point, not specific words. Questions may be repeated twice, but passages should be read only once. Be certain to obtain the subject's full attention before reading the passage or asking questions. Read the title of the passage and then, at normal speed and with appropriate intonation, read the passage. Questions follow immediately.

1.Pam's Box

Father gave Pam a big box. Pam put it on the table. She looked in the box for a doll. Then out jumped a rabbit.

<u>Questions</u>	<u>Response</u>
1. Who gave Pam the box?	Father
2. Where did Pam put the box?	On the table
3. What did she think would be in the box?	A doll
4. What was the surprise?	A rabbit

2. Woodman

John and Ann were fishing. Suddenly they heard a splash. A woodman had fallen into the lake. Because he was hurt, he could not swim. The children tried to pull him ashore. He was too heavy. Then John held the man's head above the water while Ann ran for help.

<u>Questions</u>	<u>Response</u>
1. What were John and Ann doing at the lake?	Fishing
2. What noise did they hear?	A splash
3. What had happened?	A woodman had fallen in the lake
4. Why couldn't the woodman swim?	He was hurt
5. Why couldn't the children pull him to the shore?	He was too heavy
6. How did the children help the woodman?	Held the man's head above water
7. What did the other child do?	She ran for help

3. Exploring

It was midnight. A mournful wailing sound echoed through the deserted castle. Abruptly, the girls ceased exploring. "Ghosts," whispered one girl. "Nonsense." replied the other. Nevertheless, they proceeded cautiously in the direction of the mysterious noise. Gathering courage and with mounting curiosity, the girls approached the old kitchen. Then scarcely daring to breathe, they swung open the

door. Their torches searched the darkness. Immediately, the girls' excitement turned to pity. Before them lay the farmer's dog. He was exhausted. While hunting for rats, he had been imprisoned by a gust of wind.

<u>Questions</u>	<u>Response</u>
1. At what time did the girls go the castle?	Midnight or during the night
2. What were the girls doing at the castle?	Exploring
3. What made them stop exploring?	Unusual sound A noise
4. Where was the noise coming from?	The old kitchen
5. What did they discover?	The dog
6. What had the dog been doing there?	Hunting for rats

APPENDIX 3:

Adult Test of Nonword Repetition (Gathercole & Baddeley 1996)

NONWORD MEMORY TEST
RECORD FORM

Name

D.O.B

Date of test

A.	Target	Phonetic form	Response	B.	Target	Phonetic form	Response
1.	tirrowdge	ɛɪ'rəvɔdʒ		15.	shimitet	'ʃɪmɪtɛt	
2.	merhayber	mɜ: 'heɪbə		16.	nembid	'nembɪd	
3.	goodoorwaller	ɡu: 'dɔ:wələ		17.	empliforvent	ɛmplɪ'fɔ:vənt	
4.	yarsteth	jɑ: 'stəθ		18.	zubinken	zu:'bɪnkən	
5.	malpirony	'mælpɪrəni		19.	doduloppity	dɒdʌljʊ:'lɒpɪtɪ	
6.	griodarripel	ɡrɪɔtəv'dæɪpɪ		20.	strunfab	'strʌn(ɛɪ)b	
7.	trogamus	'trɒɡæməs		21.	perplisteronk	pɜ:'plɪstəɹɒŋk	

8.	axogonobic	æc'sɔgənxɔbɪk		22.	instadrontally	ɪnstætə'drɒŋ təli:	
9.	brufid	'bru:fɪd		23.	usnat	'ʌsnæt	
10.	pascotantic	pæstəw'tæntɪk		24.	frescovent	'freskəvɛnt	
11.	stryamect	'strəɪæmɛkt		25.	pranstutuary	prœn'stɹu:tɹɪ: æɹɪ:	
12.	pennerriful	pɛ'nɛrɪfɪ		26.	tridercory	tɹɪ'dɜ:kərɪ:	
13.	cheenlope	'tʃi:nləʊp		27.	donderificam	dɒndə'rɪfɪkəm	
14.	dexiptecastic	dɛksɪptə'tæstɪk		28.	brasterer	'brɑ:stərə	

Subtotals A

Subtotals B

Subtotals A

Totals by syllable

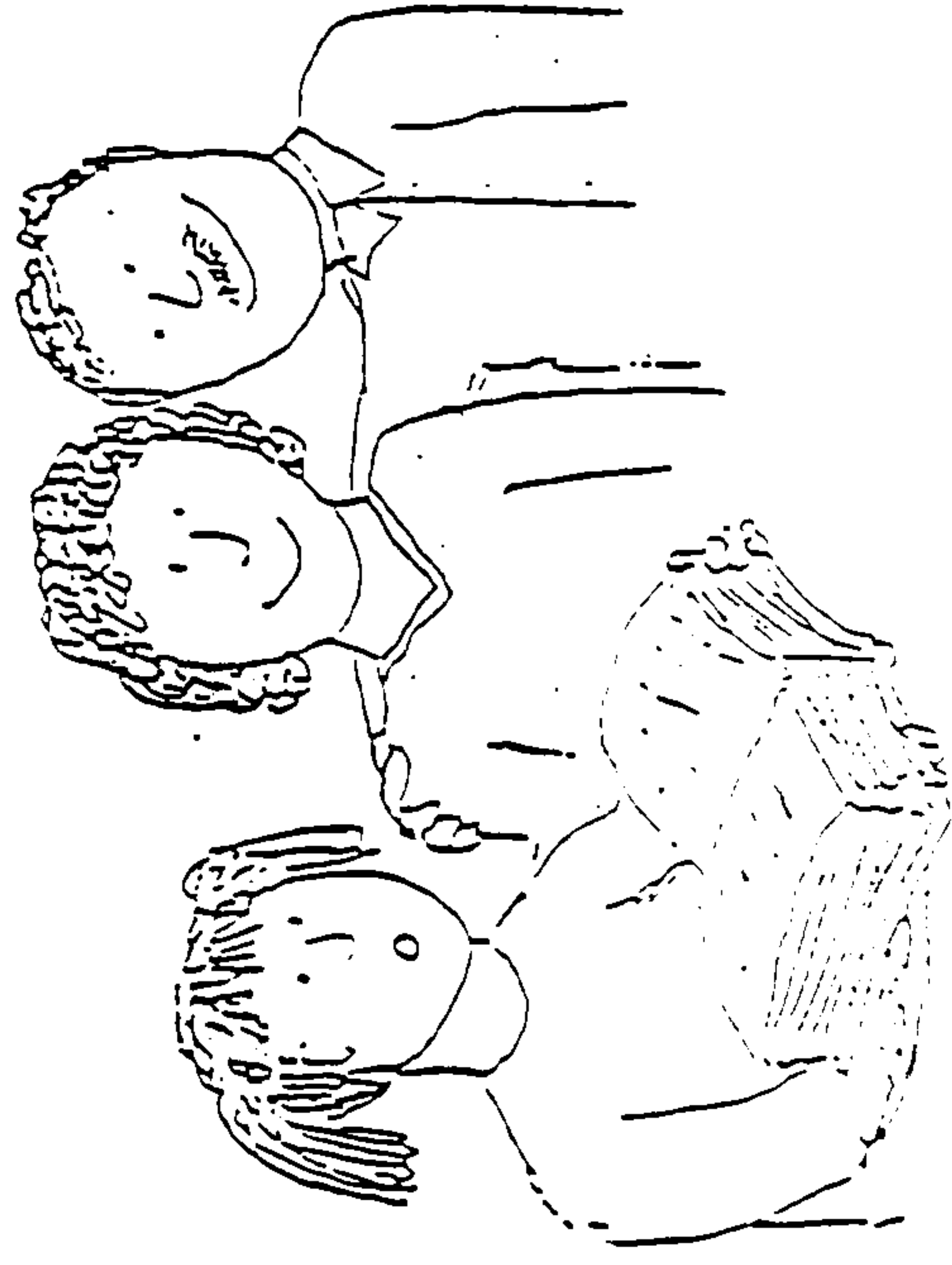
APPENDIX 4:

Strange Stories Task (Happé 1994)

Helen waited all year for Christmas, because she knew at Christmas she could ask her parents for a rabbit. Helen wanted a rabbit more than anything in the world. At last Christmas Day arrived, and Helen ran to unwrap the big box her parents had given her. She felt sure it would contain a little rabbit in a cage. But when she opened it, with all the family standing round, she found her present was just a boring old set of encyclopedias, which Helen did not want at all! Still, when Helen's parents asked her how she liked her Christmas present, she said, "It's lovely, thank you. It's just what I wanted".

Is it true, what Helen said?

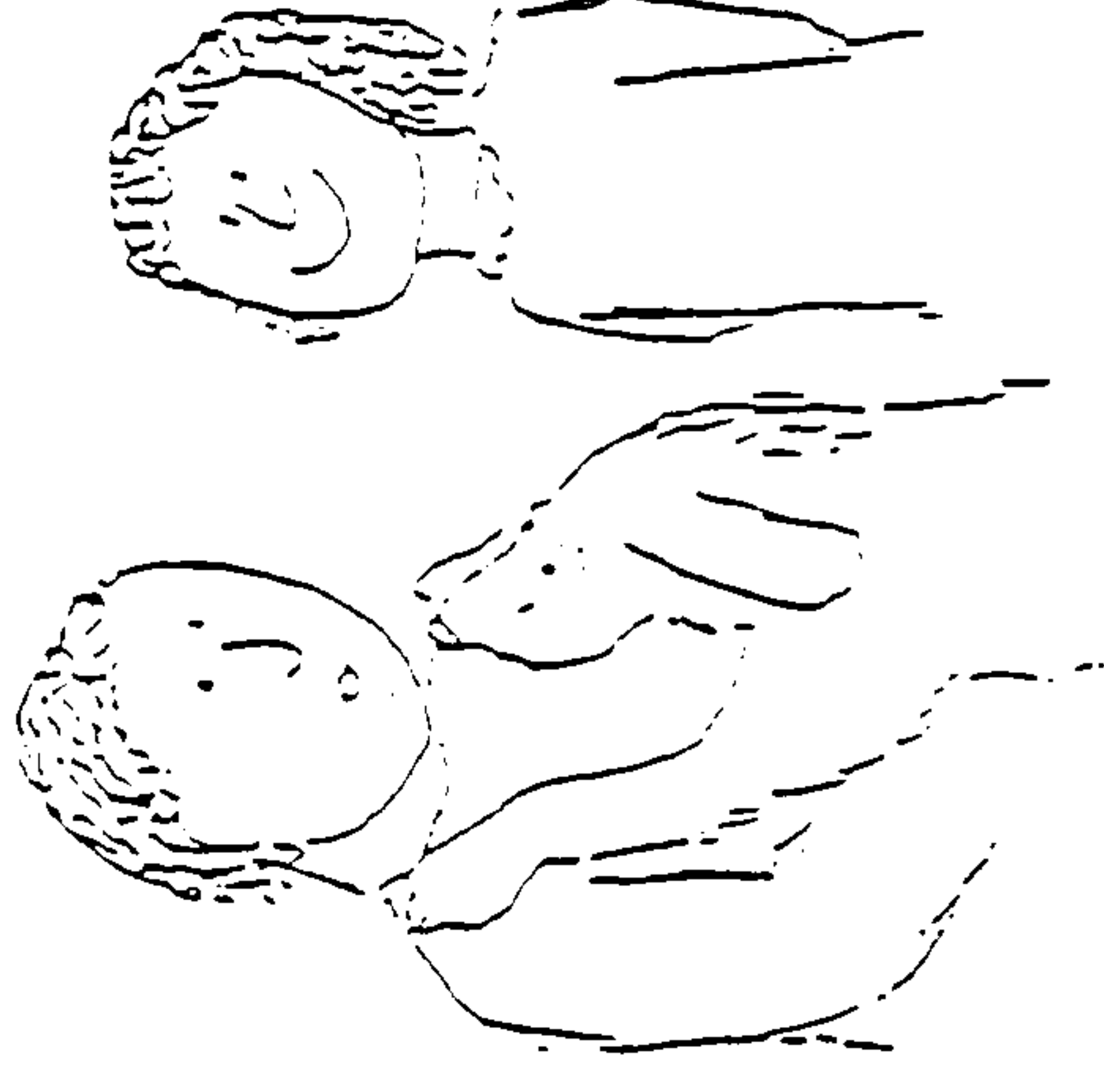
Why did she say that to her parents?



Today James is going to Claire's house for the first time. He is going over for tea, and he is looking forward to seeing Claire's dog, which she talks about all the time. James likes dogs very much. When James arrives at Claire's house Claire runs to open the door, and her dog jumps up to greet James. Claire's dog is huge, it's almost as big as James! When James sees Claire's huge dog he says, "Claire, you haven't got a dog at all. You've got an elephant!"

Is it true, what James says?

Why does James say this?



APPENDIX 5:

Malaise Inventory (Rutter, Tizzard & Whitmore (1970))

HEALTH QUESTIONNAIRE

PLEASE RING THE CORRECT ANSWER

- | | | |
|---|------------|---------------|
| Do you often have back-ache | Yes | No |
| Do you feel tired most of the time? | Yes | No |
| Do you often feel miserable or depressed? | <u>Yes</u> | No |
| Do you often have bad headaches | Yes | No |
| Do you often get worried about things? | <u>Yes</u> | No |
| Do you usually have great difficulty in falling asleep or staying asleep? | Yes | No |
| Do you usually wake unnecessarily early in the morning? | Yes | No |
| Do you wear yourself out worrying about your health? | <u>Yes</u> | No |
| Do you often get into a violent rage? | Yes | No |
| Do people often annoy and irritate you? | Yes | No |
| Have you at times had a twitching of the face, head or shoulders? | Yes | No |
| Do you often become suddenly scared for no good reason? | Yes | No |
| Are you scared to be alone when there are no friends near you? | Yes | No |
| Are you easily upset or irritated? | Yes | No |
| Are you frightened of going out alone or of meeting people? | Yes | No |
| Are you constantly keyed up and jittery? | Yes | No |
| Do you suffer from indigestion? | Yes | No |
| Do you often suffer from an upset stomach? | Yes | No |

Is your appetite poor?

Yes

No

Does every little thing get on your nerves and wear you out?

Yes

No

Does your heart often race like mad?

Yes

No

Do you often have bad pains in your eyes

Yes

No

Are you troubled with rheumatism or fibrositis?

Yes

No

Have you ever had a nervous breakdown?

Yes

No

Questionnaire completed by Mr/Mrs.....

Mr. A. L. 1

1/1/98

1/1/98

APPENDIX 6:

Schizotypal Personality Questionnaire (SPQ) (Raine 1991)

SPO

A.

- | | | | | |
|-----|----|--|-----|---------------|
| 1. | 1. | Do you sometimes feel that things you see on the TV or read in the newspaper have a special meaning for you? | Yes | No |
| 10. | 2. | I am aware that people notice me when I go out for a meal or to see a film. | Yes | No |
| 19. | 3. | Do some people drop hints about you or say things with a double meaning? | Yes | No |
| 28. | 4. | Have you ever noticed a common event or object that seemed to be a special sign for you? | Yes | No |
| 37. | 5. | Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you? | Yes | No |
| 45. | 6. | When shopping do you get the feeling that other people are taking note of you? | Yes | No |
| 53. | 7. | When you see people talking to each other, do you often wonder if they are talking about you? | Yes | No |
| 60. | 8. | Do you sometimes feel that other people are watching you? | Yes | No |

63. 9. Do you sometimes feel that people are talking about you? Yes ~~No~~
- B.
2. 10 I sometimes avoid going to places where there will be many people because I will get anxious. Yes ~~No~~
11. 11. I get very nervous when I have to make polite conversation. Yes ~~No~~
20. 12. Do you ever get nervous when someone is walking behind you? ~~Yes~~ No
29. 13. I get anxious when meeting people for the first time. Yes ~~No~~
38. 14. Do you often feel nervous when you are in a group of unfamiliar people? ~~Yes~~ No
46. 15. I feel very uncomfortable in social situations involving unfamiliar people. Yes No
54. 16. I would feel very anxious if I had to give a speech in front of a large group of people. Yes ~~No~~
71. 17. I feel very uneasy talking to people I do not know well. ~~Yes~~ No

- C.
3. 18. Have you had experiences with the supernatural? Yes No
12. 19. Do you believe in telepathy (mind reading) Yes No
21. 20. Are you sometimes sure that other people can tell what you are thinking? Yes No
30. 21. Do you believe in clairvoyancy (psychic forces, fortune telling)? Yes No
39. 22. Can other people feel your feelings when you are not really there? Yes No
47. 23. Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense? Yes No
55. 24. Have you ever felt that you are communicating with another person telepathically (by mind reading) Yes No
- D.
4. 25. Have you often mistaken objects or shadows for people, or noises for voices? Yes No

- | | | | | |
|-----|-----|--|-----|-----------|
| 13. | 26. | Have you ever had the sense that some person or force is around you, even though you cannot see anyone? | Yes | <u>No</u> |
| 22. | 27. | When you look at a person, or yourself in a mirror, have you ever seen the face change right before your eyes? | Yes | <u>No</u> |
| 31. | 28. | I often hear a voice speaking my thoughts aloud? | Yes | <u>No</u> |
| 40. | 29. | Have you ever seen things invisible to other people? | Yes | <u>No</u> |
| 48. | 30. | Do everyday things seem unusually large or small? | Yes | <u>No</u> |
| 56. | 31. | Does your sense of smell sometimes become unusually strong? | Yes | <u>No</u> |
| 61. | 32. | Do you ever feel suddenly distracted by distant sounds that you are not normally aware of? | Yes | <u>No</u> |
| 64. | 33. | Are your thoughts sometimes so strong that you can almost hear them? | Yes | <u>No</u> |
| E. | | | | |
| 5. | 34. | Other people see me as slightly eccentric (odd). | Yes | <u>No</u> |

14. 35. People sometimes comment on my unusual mannerisms and habits. Yes ☒ No ☐
23. 36. Sometimes other people think that I am a little strange. Yes ☒ No ☐
32. 37. Some people think that I am a very bizarre person? Yes ☒ No ☐
67. 38. I am an odd, unusual person. Yes ☒ No ☐
70. 39. I have some eccentric (odd) habits. Yes ☒ No ☐
74. 40. People sometimes stare at me because of my odd appearance. Yes ☒ No ☐
- F. 41. I have little interest in getting to know other people. ☒ Yes ☐ No
15. 42. I prefer to keep myself to myself. Yes ☒ No ☐
24. 43. I am mostly quiet when with other people. Yes ☐ No ☐
33. 44. I find it hard to be emotionally close to other people. Yes ☐ No ☒

41. 45. Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems. Yes (No)
49. 46. Writing letters to friends is more trouble than it is worth. Yes No
57. 47. I tend to keep in the background on social occasions. Yes (No)
62. 48. I attach little importance to having close friends. Yes (No)
66. 49. Do you feel that you cannot get "close" to people? Yes (No)
- G. 50. People sometimes find it hard to understand what I am saying. (Yes) No
16. 51. I sometimes jump quickly from one topic to another when speaking. Yes (No)
25. 52. I sometimes forget what I am trying to say. Yes (No)
34. 53. I often ramble on too much when speaking. (Yes) No

42. 54. Some people find me a bit vague and elusive during conversation. Yes ~~No~~
50. 55. I sometimes use words in unusual ways. Yes ~~No~~
58. 56. Do you tend to wander off the topic when having a conversation? Yes ~~No~~
69. 57. I find it hard to communicate clearly what I want to say to people. Yes ~~No~~
72. 58. People occasionally comment that my conversation is confusing. Yes ~~No~~
- H.
8. 59. People sometimes find me aloof and distant . Yes ~~No~~
17. 60. I am not good at expressing my true feelings by the way I talk and look. Yes ~~No~~
26. 61. I rarely laugh and smile. Yes ~~No~~
35. 62. My “nonverbal” communication (smiling and nodding during a conversation) is not very good. Yes ~~No~~

- | | | | | |
|-----|-----|---|-----|------|
| 52. | 72. | Have you found that it is best not to let other people know too much about you? | Yes | (No) |
| 59. | 73. | I often feel that others have it in for me. | Yes | (No) |
| 65. | 74. | Do you often have to keep an eye out to stop people from taking advantage of you? | Yes | (No) |

43. 63. I am poor at returning social courtesies and gestures. Yes ~~(No)~~
51. 64. I tend to avoid eye contact when conversing with others. Yes ~~(No)~~
68. 65. I do not have an expressive and lively way of speaking. Yes ~~(No)~~
73. 66. I tend to keep my feelings to myself. Yes ~~(No)~~
- I.
9. 67. I am sure I am being talked about behind my back. Yes ~~(No)~~
18. 68. Do you often feel that other people have it in for you? Yes ~~(No)~~
27. 69. Do you sometimes get concerned that friends or coworkers are not really loyal or trustworthy? Yes ~~(No)~~
36. 70. I feel I have to be on my guard even with friends. Yes ~~(No)~~
44. 71. Do you often pick up hidden threats or put downs from what people say or do? Yes ~~(No)~~

APPENDIX 7:

Client Service Receipt Inventory

CLIENT SERVICE RECEIPT INVENTORY - LANGUAGE DEVELOPMENT
STUDY ADULT VERSION

030997

C:\CHollis.wpd

I am going to ask you some questions about when you were growing up and about any services you may have used because of language problems.

Respondent's name _____

Interview date _____

CHRONOLOGY OF LIFE EVENTS

Please tell me about any health, employment, accommodation changes from 16 - 37 for you
Chronology of Life Events. Draw a line to show length of time for particular event.
for example 16 - 21 full time job as a carpenter 22 - 23 unemployed. 16 - 18 lived with parents.

	16 - 18	19 ^t - 21	22 - 24	25 - 27	28 - 30	31 - 33	34 - 36	37 on
Health								
Employment								
Accommodation								

1.1 Please think back to when you were at primary school and secondary school (4 - 16) did you ever see anyone to help you with learning difficulties during this period?

For example did you see any language specialists, people from the education department or spend any extra time with teachers from school?

(Show card number 1 - probe respondent for any additional services not mentioned on the list.)

(If the subject was in a special day school and had continual attention for eg language difficulties put number of times saw professional as 195.)

20

(Example: psychologist 5-6 years/15 months/once a week)	Between what ages (approximately)	Approximate number of months over which service was used	Approximate total number of times saw each professional
Special needs teacher (eg extra reading classes)			
Speech and language therapist			
Regular teacher giving special needs help			
Welfare officer			
Educational Social worker			
Clinical Psychologist (works for the NHS)			
Educational Psychologist (works for the Education Department)			
Day centre for children with language disorder			
Special boarding school			
Special day school			

ACCOMODATION

I am going to ask you a few questions about your living arrangements

2.0 At the moment who do you live with?

- Lives alone 1
- Lives with one or both parents 2
- Lives with relatives 3
- Lives with friends 4
- Lives with partner/spouse 5
- Other (please specify) 6

2.1 What kind of accommodation is it?

- Owner occupied 1
- Rented from local authority/ health authority 2
- Privately rented 3
- Staffed hostel/group home 4
- Unstaffed group home 5
- Sheltered housing 6
- Boarding house 7
- Other (please specify) 10

2.2a) How long have you lived at this address? Months
Years /

If respondent does not live in a house or flat (If lives in flat/house skip to 2.2c)

2.2b)What is the name and address of where you live?

Name _____

Address _____

2.2c) How many different places have you lived in the last 5 years?
(Probe: that is since (month) in 1992)

Number 5

2.3 Please describe the different places you have lived in the last 5 years, for example whether they were owner occupied or rented from the council or housing association?
(Probe for living arrangements since (month) 1992 - refer to front page and prompt their memory by using birthdays and christmas)

	Description of type of accommodation <i>(refer to question 2.1)</i>
First	3
Second	19 2
Third	3
Fourth	3
Fifth	5
Sixth	
Seventh	
Eighth	
Nineth	

Code

Owner occupied	1	Unstaffed group home	5
Rented from LA/HA	2	Sheltered housing	6
Privately rented	3	Boarding house	7
Staff hostel/group home	4	Other	10

SERVICE RECEIPT - HEALTH

I am going to ask you some questions about whether you had to go to the hospital in the past 5 years.

3.0 Did you either have to stay overnight or go to hospital during the day within the last 5 years?

YES 1
NO 2

3.1 How many times did you stay overnight in the hospital in the last 5 years? (Inpatient attendances prompt subject by giving suggestions of reasons why they might have gone to hospital.)

Attendances	Reason for staying overnight at the hospital (eg tonsillectomy, cut head)	Name of hospital	How many nights did you stay at the hospital?
1	Swollen tonsils	North Devon District Hospital	4
2			
3			
4			
5			

3.2 How many times did you go to hospital for a few hours without staying overnight in the last 12 months? (*outpatient attendances*)

Attendances	Reason for attending the hospital (eg to have stitches)	Name of hospital
1	Stitching	St. Mary's
2		
3		
4		
5		

3.3 Please describe any occasions when you have spent the whole day in the hospital without staying overnight within the last 12 hours? (*Day hospital attendances*)

Reason for attending (eg occupational therapy)	Approximate number of weeks over which service was used	Hospital name	Approximate total number of times a professional was seen
1			
2			
3			
4			
5			

3.4 Have you used any primary and community care services over the last 12 months? For example GP services, social services, home help or speech and language services?

(Show card 2)

Services	Home visit? Yes 1 No 2	Total number of contacts in the last 12 months	Approximate duration of contact in hours per session	Total amount of time spent with professional to the nearest ½ hour.
Speech and language therapy				
Nurse	0	1	5	
Audiologist				
GP	2		10	
Psychiatrist				
Psychologist				
Social worker				
Community health centre				
Day care/drop in center				
Home help				
care worker				
Voluntary service eg. Mind/Autistic society				
Disability employment advisors (from job centre)				
Occupational psychology assessment	1			
Other: please specify				
			15	

EMPLOYMENT AND INCOME

I am going to ask you some questions about your employment, everything you tell me will be kept strictly confidential.

4.0 What is your current employment status? *(Circle wherever relevant)*

- Employed 1
- Sheltered employed 2
- Unemployed 3
- Student 4
- Housework, childcare 5
- Retired 6
- Other 10

4.1 *(If X is employed if not go to 4.3)* What is your job?
(Please note down voluntary If job is unpaid)

.....
.....

4.2 What gross wage do you earn from employment? Monthly £
(Note gross income = before tax and other deductions)

(If employed go to question 4.5)
4.3 *(If unemployed:)* How many months or years has it been since you were last employed?
(Help respondent work out number of months by prompting them eg birthdays/christmas)

Month 28
Year

4.4 *(If unemployed:)* What was your last paid job? Carman

If respondent lives with a primary carer in a house/flat otherwise skip to 4.7

I am going to ask you some questions about your financial contribution to the household, Please answer the questions as best you can, estimating answers where you are unsure.

4.5 Do you contribute money to the household income?

YES

1

NO

2

4.6 On average how much money do you contribute to the household per week?

Per week

NA

8

4.7 Please look at this card and state your gross household income this includes all members of the household.

(If respondent is reticent to answer assure them that data is totally confidential.)

(Show card 3 with income brackets)

(Note gross income = before tax and other deductions)

1

Under £60

5 £701 - £1000

2

£61 - £100

6 £1001 - £1300

3

£101 - 400

7 £1301 - £1600

4

£401 - £700

8 £1601 or more

4.8 At the moment do you receive any state benefits?

YES

1

NO

2

b) If yes: What benefits do you received? Circle appropriate number(s)

Income support

1

Attendance allowance

2

Disability living allowance

3

Housing benefit

4

Unemployment benefit

5

DSA disabled allowance

6

Other

7

THANK YOU FOR YOUR HELP

(Interviewer calculate refer to the chronology at the start of the interview donot ask respondent)

What is the total number of months the subject was employed approximately?

.....Yearsmonths

What is the total amount of time the subject was living independently since he was 16?

.....Yearsmonths

What is the total amount of time the subject was being cared for either by family or in support accommodation.

.....Yearsmonths

How much time in years and months has passed since the subject was interviewed on this project?

(Ask subject: period should be during the 80's and the subject was in his 20's)

.....Yearsmonths

CARD NUMBER 1

PRIMARY AND SECONDARY SCHOOL SERVICES

1	SPECIAL NEEDS
2	SPEECH AND LANGUAGE
3	NORMAL TEACHER GIVING SPECIAL NEEDS HELP
4	WELFARE OFFICER
5	EDUCATIONAL SOCIAL WORKER
6	PSYCHOLOGIST
7	DAY CENTRE FOR LANGUAGE DISORDER
8	BOARDING SCHOOL FOR LANGUAGE DISORDER
9	OTHER PLEASE SPECIFY

CARD NUMBER 2

PRIMARY AND COMMUNITY CARE SERVICES

1	SPEECH AND LANGUAGE THERAPY
2	NURSE
3	AUDIOLOGIST
4	GP
5	PSYCHIATRIST
6	PSYCHOLOGIST
7	SOCIAL WORKER
8	COMMUNITY MENTAL HEALTH TEAM
9	DAY CARE/ DROP IN CENTRE
10	HOME HELP/ CARE WORKER
11	DENTIST
12	OPTICIANS
13	OTHER PLEASE SPECIFY

CARD NUMBER 3

INCOME BRACKETS

1	UNDER £ 60
2	£61- £100
3	£101 - £175
4	£176 - £275
5	£276 - £325
6	£326 - £450
7	£451 - £600